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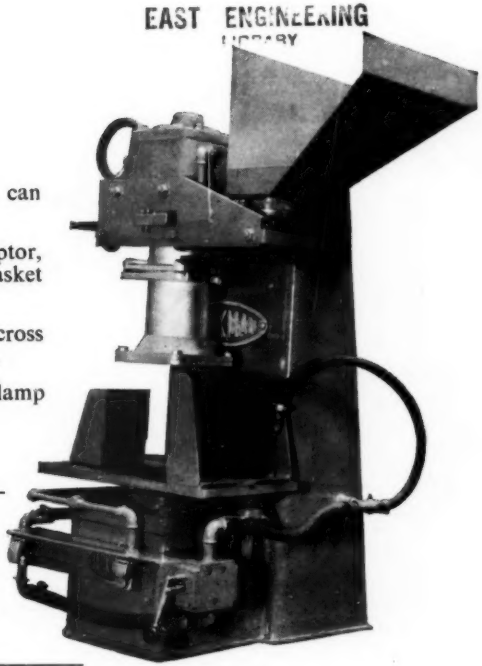

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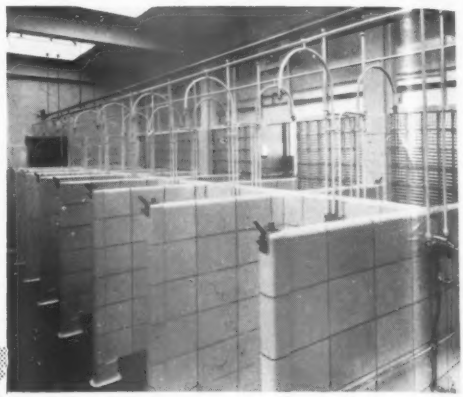

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Editor:
V. C. FAULKNER, F.R.S.A., HON.M.I.B.F.

Assistant Editor: A. R. PARKES, M.I.B.F.
Commercial Editor: P. E. CARDEN.
Advertising Manager: LENNOX HOLT, M.I.B.F.
Production Manager: R. J. LOVELL.
Publisher: H. J. DWYER.
Circulation Manager: E. T. GRIFFITHS.

District Representatives:
G. P. ELLIOTT (*Northern Area*)
T. H. SMITH (*Scotland*)

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The Journal and the Institute

In 1904, Editorial propaganda in the FOUNDRY TRADE JOURNAL resulted in the formation of the British Foundrymen's Association, later to become the Institute of British Foundrymen. From that time onwards, the JOURNAL has —first month by month and from 1921 week by week— been the main source of support for the Institute, and the outstanding growth of both organizations has reflected this close collaboration. It is certainly true to say that the Institute's progress has been ceaselessly and loyally fostered, over the years, by a journal that has carried its message to every part of the world and every section of the industry.

Rising costs have affected the Institute, like every other enterprise, and the Council of that body has therefore decided that increased revenue shall be obtained by the issue of its proceedings in monthly form, supported by advertisements. This they deem to be the most efficacious step to take. Opinions have not been undivided as to its wisdom, but our practical help has been sought and unstintingly given, as seemed warranted by such a long and friendly association. This help has been warmly appreciated by the Council.

The new venture will, of course, not be without its effect on the Editorial policy of the FOUNDRY TRADE JOURNAL. Freed from moral obligation to publish the maximum number of Institute papers, it can now tap its own unrivalled resources to give the industry more practical and technical articles to the exclusion of those of more academic interest. More space will be available to carry illustrated descriptions of foundries and the plant and methods used in them, both at home and abroad. For the promotion of the export trade, too, it is essential for us to take cognizance of founders overseas, as of each 1,000 copies coming off the Press every Thursday morning, no fewer than 407 go abroad.

The editing and publishing of a technical journal is a highly specialized task which, some may hold, is one best left to those with a lifetime of experience. Neverthless, we naturally wish the Institute every success in its laudable desire to give, through potentially increased revenue, greater service to the members of the Institute. This we well know to be essential, as it has been the unswerving objective of this JOURNAL from its very inception to give quick and detailed attention to queries and difficulties. It will still be our policy to enhance these services to both readers and advertisers, a course which we are confident will meet with general approbation. The propaganda which we shall continue to accord to the work of the Institute will thus not only be of material help, but will also, we hope, foster even more intensely the goodwill which has so long existed between us.

G

Post-graduate Study Awards

New arrangements for awards for post-graduate study were announced on Tuesday, by the Ministry of Education and the Department of Scientific and Industrial Research, who have recently concluded, in consultation with the committee of vice-chancellors and principals of universities of the United Kingdom, a full review of the present system. New competitive awards to be known as State Studentships will be offered annually by the Ministry of Education to students considered by their universities to be specially qualified for post-graduate study in arts subjects. The awards, of which about 250 will be offered in 1957, will be available from the beginning of the academic year, and will be open to all graduates of British universities who are normally resident in England and Wales. The Minister intends to appoint a board to advise him on the selection of candidates, and usually only those with outstanding academic attainments will be considered.

From 1957-58, the Department of Scientific and Industrial Research will offer a considerably increased number of competitive post-graduate awards in science and technology. These will be made on a similar basis to the State Studentships and will be available not only for training in research but also for advanced instructional courses lasting more than six months.

Awards to State scholars who have already started on post-graduate studies which will not be completed by the summer of 1957, will be continued by the Ministry and, it is hoped, by local education authorities. Present arrangements for awards to students in medicine, dentistry, agriculture and veterinary science are not affected, nor are those for aiding graduate teachers.

Film Review

"Birth of a Car." "Sound" film made by Ace Distributors, Limited, for the British Iron and Steel Federation. Prints, 16- and 35-mm., are available on free loan on application to the Public Relations department of the Federation at Tothill Street, London, S.W.1.

This is a prestige film for British cars, the engineering workmanship and some of the materials embodied in their production. It begins by illustrating the first car used in this country and continues by showing phases of modern car construction against a background of testing, both in the works and on the track.

Although it is claimed to be the first film of this type which has no bias towards any particular firm of car makers, this claim—for the cognoscenti—would be better substantiated had a greater variety of cars been photographed. The reviewer would also have liked to have seen incorporated at least a mention that the engine—in no respect a minor component—is basically a casting. In fact, however, the only castings mentioned are malleable-iron bushes for the king pins and brake-drums of the same material. The wisdom is doubled of showing (and stating) that lorry-loads of sheet steel scrap come out of the body works at the same time as loads of new sheets enter; it might tend to make the layman think at least 50 per cent. of the material is process scrap. Then again, the shots of road congestion with which the film closes—along with the exhortation that a solution must be found—are surely not conducive to increased car sales, presuming this is a subsidiary objective of the film.

Despite these minor criticisms, the film does fulfil its major purpose. Spring making, valve manufacture and testing of these components are among the themes well demonstrated. As a 25-min. relaxation, the film will appeal mainly to non-technical audiences.

Dinner

JOINT IRON COUNCIL

The annual convention banquet of the Joint Iron Council was held at the Dorchester Hotel, London, on November 6, at which Mr. N. P. Newman, J.P., president of the Joint Iron Council and chairman of the Council of Ironfoundry Associations, presided. At the high table were Sir Colin S. Anderson; Sir George Barnett; Sir John Benstead, C.B.E.; Mr. J. Bowman, C.B.E., J.P.; Sir Edward Boyle, BART., M.P.; Mr. F. C. Braby, M.C., D.L., B.SC.; the Rt. Hon. Henry Brooke, M.P.; Mr. Winthrop G. Brown; the Rt. Hon. the Viscount Bruce of Melbourne, P.C., C.H., M.C., F.R.S.; Mr. E. Carey-Hill; Mr. Robert Carr, M.P.; Major L. E. Cotterell, T.D.; Lieut.-Gen. Sir John Eldridge, C.B., C.B.E., D.S.O., M.C.; Sir Lincoln Evans, K.B.E.; Sir Archibald Forbes; Mr. C. S. Garland, A.R.C.S., B.SC.; Mr. Malcolm J. Glenny; Sir Graham Hayman; Mr. V. Jobson; Mr. G. H. Johnson; Mr. Emil Kekich; Sir Ernest Lever; Mr. S. W. Martin; Sir John Morison, G.B.E.; Mr. R. P. Morison, Q.C.; Mr. Frank A. Perkins; Prof. Sir Eric Rideal, M.B.E., F.R.S., D.SC., F.R.I.C.; Mr. L. Robinson, C.B.; Mr. S. H. Russell; Sir Frederick Scopes; Sir Robert Shone, C.B.E.; Colonel Sir Harold Smith, K.B.E., D.L.; Mr. J. F. Stanier; Mr. S. N. Turner, J.P.; Mr. L. F. K. Van Vredenburch; Colonel J. W. Watkins, C.V.O., D.S.O., M.C.; Sir Harold West, J.P., and Mr. H. J. V. Williams.

After the loyal toasts, the "Iron Industry" was proposed by Sir Edward Boyle, M.P., Economic Secretary to the Treasury, and replied to by Mr. E. Carey-Hill, chairman of the Association of Automobile and Allied High-Duty Ironfounders; Mr. Newman proposed the toast to "The Guests" and Sir Colin S. Anderson, president, the British Employers' Confederation, responded. During his speech, Mr. Newman presented to Mr. Winthrop G. Brown, director of the United States Operations Mission in London, an illuminated address, in appreciation of help given, by funds made available under Conditional Aid, to promote technical training in ironfounding and research in matters concerning health, safety, productivity and fuel economy. A pair of fruit plates, specially cast from an old and elegant pattern at the Coalbrookdale, Shropshire, foundry of Allied Ironfounders, Limited, was also presented as a personal token gift to Mr. Brown. There was a substantial number of guests among the 600 attending the dinner.

Indian Steelworks Contracts Signed

Final contracts for the construction by a British consortium of an integrated iron and steel plant at Durgapur, in west Bengal, were signed by representatives of the Indian Government and the Indian Steelworks Construction Company in New Delhi last week.

Campbell, Gifford, & Morton, Limited, consulting engineers, has been invited by the Indian Government to draw up plans for the plant to produce annually 150,000 tons of steel castings, 25,000 tons of grey-iron castings, and 5,000 tons of steel forgings.

IBF London Branch Visit to Lafarge. A number of verbal requests have been received for copies of the group photograph taken when the London branch of the Institute of British Foundrymen visited the West Thurrock works of Lafarge Aluminous Cement Company, Limited. So that the required number of prints can be prepared in one operation, will those members requiring them please inform the Lafarge concern at 73, Brook Street, London, W.1.

Sheffield Foundry Exhibition

Comprehensive Displays at Edmund Road Drill Hall, November 14 to 17

Latest developments in foundry materials, machinery, equipment and supplies, in addition to castings themselves, research and educational displays, are to be the main features of a four-day exhibition in Edmund Road Drill Hall, Sheffield, from November 14 to 17. The whole has been organized by the Sheffield section of the National Trades Technical Societies and the Sheffield branch of the Institute of British Foundrymen.

The exhibition will be open on each of the first three days, Wednesday to Friday (November 14 to 16), from 2 p.m. to 9 p.m., and on the Saturday from 10.30 to 8 p.m.; admission is free and all foundrymen and engineers who can do so are invited to attend.

The opening ceremony at the exhibition at 2 p.m. on the Wednesday will be performed by the Lord Mayor of Sheffield (Alderman R. Neill); he will be supported by the Master Cutler, Sir Peter Roberts, Bart., the president of the Sheffield Chamber of Commerce (Col. C. R. Hodgson, D.S.O.), the president of the Institute of British Foundrymen (Mr. H. J. V. Williams), and the past-president of the National Trades Technical Societies (Mr. W. D. Pugh). The ceremony will be preceded at noon by a luncheon over which the chairman of the exhibition committee, Mr. R. F. Horton, will preside, accompanied by Mr. F. A. Hurst, past-president of the Sheffield Chamber of Commerce; Mr. J. F. Stanier, president of the Sheffield branch of the Institute; Mr. H. Humphries, vice-president of the NTTS and managing director of Hadfields, Limited; Mr. Ambrose Firth, vice-chairman of the Chapeltown branch of the NTTS and managing director of Brightside Foundry & Engineering Company, Limited; Mr. J. H. Pearce, secretary of the Sheffield branch of the Institute, and a number of guests from the foundry and kindred industries. During the run of the exhibition, there will be organized parties, *inter alia*, of technical college and other students, and employees from the local works.

Layout

The stands are arranged on the ground and first floors of the Drill Hall and mainly comprise wall-type units 16 ft. by 8 ft. and centre units 14 ft. 9 in. by 8 ft. There are nearly 50 stands, numbers one to 37 being on the ground floor. Here there are also the exhibition office and the educational displays. On the first floor, the whole of the centre stand (54-ft. long) is devoted to displays of the work of foundry apprentices. The FOUNDRY TRADE JOURNAL stand (No. 43) is on this floor and there is also a refreshments section. Group and association exhibitors include the Association of Bronze and Brass Founders (No. 41), local gas and electricity boards, the Rotherham College of Technology (42), and the joint stand (45) of the British Steel Founders' Association and the British Steel Castings Research Association.

Many firms prominent in the foundry plant, equipment and supplies fields have stands (see later) and castings of high quality from Sheffield and district will be on view. The educational display will stress the importance of the foundry industry, local foundry achievements (both recent and historical), and skilled foundrymen will be shown actually working at their jobs. The apprentice section will show a number of entries for the local IBF branch competition for which over 50 were received in the patternmaking section and over 60 in the moulding.

Details of the Stands

Edgar Allen & Company, Limited (stand 15).—The exhibit of Edgar Allen & Company, Limited, includes a motor-generator yoke for an electric locomotive with the two halves of the mould complete with cores; no fewer than 37 cores are required to produce this casting. While the moulds are produced on jolt/roll-over moulding machines, the cores are rammed by hand. The body core in particular must be made weak enough to prevent hot-tearing of the casting as cooling takes place. At the same time, all surfaces of both moulds and cores must resist the passage of the hot metal over them, to ensure a good strip and a minimum of dressing. The steel used is one giving high magnetic permeability and satisfactory mechanical strength.

Armstrong Whitworth & Company (Pneumatic Tools) Limited (stand 38).—The main feature of this stand is the entirely new range of high-frequency tools manufactured by this company comprising grinders, sanders, buffers and wire-brush machines. Practical experience of foundry problems has resulted in the design and manufacture of these outstanding tools.

Birlec Limited (stand 33).—Exhibits of this company include a 15 kw. induction heating power unit and small melting furnace; 35 kw. Birlec Tama furnace; Birlec I.C. Detroit; and a mechanized model of a 30-ton arc melting furnace.

The self-contained medium-frequency power package on the stand is designed to operate equipment for melting, hardening, annealing, sintering, brazing, pre-heating, hot-forming and vacuum-heating processes.

The melting unit exhibited has a 30-lb. melting capacity, and whereas it is intended for ferrous melting, it can be arranged, with suitable crucibles, to be employed for non-ferrous metals.

The 35 kw. Birlec Tama low-frequency furnace exhibited will melt approximately 150 lb. of aluminium or other light alloy per hour. The main features include highly-efficient heating at low running costs, accurate automatic temperature control and uniform stirring of the melt, giving homogeneous composition and enabling consistent and accurate alloy specifications to be met. A self-contained indirect-arc electric melting furnace with a molten metal capacity of approximately 10 lb. is also on the stand.

Brightside Heating & Engineering Company, Limited (stand 25).—Exhibited is a model ablution centre and the

Sheffield Foundry Exhibition

engineering services within it, in which this company specializes. They comprise heating services, clothing lockers and washing services, including showers, wash-basins and foot-baths. Also shown is a representative arrangement of Brightrad radiant panels heating a moulding bay, a standard 4 by 8 ft. panel from the firm's range of industrial radiant heating and a range of Brightrad radiant strip panelling for industrial heating.

British Electro Metallurgical Company, Limited (stand 39).—Bemco are exhibiting quite a number of the 160 or so ferro-alloys and metals which they supply. Deoxidants and alloying materials for steel, specially-prepared alloys for iron (including briquetted alloys designed to prevent excessive alloy losses in the cupola, and crushed, graded alloys for ladle or spout addition) and several very high purity metals which have essential uses in the non-ferrous trade. Features of unusual interest are the sections relating to the new high-manganese, low-nickel austenitic stainless-steels and the range of modern exothermic alloys which are causing something of a revolution in certain aspects of melting practice.

British Foundry Units Limited (stand 26).—A range of core binders, together with cores produced from such materials, and details of technical control, *i.e.* mixture and baking times and temperatures, to provide economical, fume-free coreshop control is exhibited. Exothermic compounds and sleeves or bushes, made from these materials for the reduction of piping and economy of metal in feeder heads and risers are also shown, together with cupola flux for iron foundry use, for cleansing and desulphurizing cast iron, and flux for use in brass, bronze and non-ferrous foundries, for efficient removal of drosses and impurities.

Also on this stand can be seen the firm's range of foundry blackings and plumbagoes, including spirit blackings and facings, and Crulin Flam paint for use on cores and moulds, produced by the CO_2 Process, to produce castings with a clean, smooth skin; coal-dust for foundry use in various gradings; the "Vortec" core-sand mixer, available in capacities of 56, 112 and 400 lb.; the "Vortec" blacking mixer available in capacities of 2 and 5 gall.; the Anson shell-moulding machine, designed for simplicity of operation and rapid mould production, and also a range of foundry requisites and sundries, including ladles, etc.

British Moulding Machine Company, Limited (stand five).—The British Moulding Machine Company will be showing on stand No. 54, one of their new type B.Q.3 machines arranged for automatic operation, and it will be actually making moulds in boxes 25 by 21 by 7 in. On this type of machine, empty boxes are rolled on to one side, and finished moulds rolled off the other, with the result that at no time does the operator require to lift either box or mould. The device for operating the machine automatically is of an entirely new type without electronics and does not even contain simple electrics. Entirely pneumatic in operation, this valve can be adjusted to cycle in 15 to 16 sec. and if required, the machine can be manually operated without adjustment or delay of any kind.

British Steel Castings Research Association (stand 45).—The BSCRA, whose new laboratories are about to be opened in Sheffield, is the collective research organization for the producers of about 80 per cent. of the total output of steel castings in the UK. Its research programme includes investigations into moulding and coremaking materials and techniques, steelmaking, the properties of cast steels, and engineering problems associated with foundry equipment. One of its achievements, which will be illustrated, is the design of dust-control systems for grinding machines. These systems, having been officially approved, are now being widely adopted in the industry with a consequent improvement of working conditions.

British Steel Founders' Association (stand 45).—The activities of the Association are wide and various. Amongst them is the production of publications aimed at making better understood the function and the product of steel foundries. Examples will be shown and copies can be obtained on application to the director.

Broom & Wade Limited (stand 36).—A comprehensive range of pneumatic tools is shown including: chipping and scaling hammers, Multivane grinders, die grinders, sand rammers, mould vibrators, a range of sanders, wire brushes, and drills, core pick, plugging drill outfit, and a new improved model No. 289 blow gun. A working model of the new lightweight air-operated chain block, also 1-ton capacity air hoist and a cylinder hoist are on view. Descriptive literature and catalogues are available for a complete range of stationary and portable air-compressor plants.

David Brown Foundries Company (stand seven).—To illustrate the wide variety of industries supplied with a variety of often highly complex castings from their foundries, the company is exhibiting a comprehensive selection of rough and partly-machined castings in steel and bronze, produced by processes which were either pioneered, or first applied, at Penistone. For several years, one of the aircraft industry's leading suppliers of airframe and engine castings, the company will show representatives of those produced to the official material specifications DTD666 and DTD705 affecting airframe and engine applications. These exhibits are in high-tensile and heat-resisting steel. Also displayed are castings for oilfield wellhead equipment, a branch of foundrywork which was an American monopoly for many years. Examples of other specialized products include pressure castings for hydraulic cylinders and valve bodies, castings for mechanical-excavator components, including sprockets, links and track plates, and an underfeed stoker screw—cast in carbon steel. Alongside them are selections of shell-moulded and precision castings, and stainless-steel castings for pump impellors and components. "Taurus" bronze castings produced by either the centrifugal or sand methods include a rolling-mill screw box.

Catalin Limited (stand 19).—On the stand may be seen a selection of synthetic resins, together with actual examples of cores, shells and moulds produced therewith. Special attention is drawn to:—core-bonding resins, shell-moulding resins, sand pre-coating resins, flame-set spray resins and castings resins for pattern-making. A technical advisory service is at the disposal of the foundry industry and demonstrations of "Catalin" resins in customers' works will gladly be arranged upon request.

Dustuctor Limited (stand four).—The Dustuctor L.V.H.V. system uses small volumes of air at very high velocity to control the fine dangerous dust generated by portable pneumatic and electric tools. The particles of dust between 0.2 and 5 microns in size which cause respiratory diseases, are thus brought under control at source before escaping into the atmosphere. Dustuctor devices have now been made to operate successfully on fettling chisels, radial and surface grinders, wire brushes and sanders. The low volume of air at high velocity enables lightweight hose to be used. The L.V.H.V. system works at a depression of 5 in. of mercury obtained by compressed air "Eductors"

(ejectors) or by electrically-driven rotary or turbo exhausters. Dust is collected by primary cyclone separators combined with cloth filters of suitable design.

East Midlands Gas Board (stand two).—Typical installations exhibited here by the East Midlands Gas Board are a 20-cwt. steel capacity bottom-pouring ladle with heat-resisting steel cover (E. A. Roper & Company Limited, Keighley), and precision burner equipment (British Furnaces, Limited, Chesterfield) with gas rate 600 cub. ft. per hour. 30 min. from cold to 800 deg. C.

For core drying a modern unit (F. J. Ballard & Company, Tividale) complete with automatically-controlled burners, flame-failure pilot safety devices and safety explosion relief panel is on view, with gas rate 150 to 300 cub. ft. per hour, according to oven size. Examples of proprietary burners and several types of burner jets and injectors will be on display and in operation.

Edwards High Vacuum Limited (stand 35).—Edwards exhibit a standard research high-vacuum furnace together with sample ingots produced. Typical ingots produced in standard industrial vacuum 56-lb. capacity and vacuum arc furnaces are also shown. Larger high-vacuum furnaces are manufactured and the samples display the elimination of gas porosity and great density characteristic of vacuum casting which go together with higher tensile strength, higher ductility and better stress and rupture figures as well as improved fatigue and creep properties. Also exhibited is the "Telegas," a robust, practical, but sensitive instrument for rapid determination on the foundry floor of the hydrogen content of aluminium (or aluminium alloy) melts. Accurate knowledge of the hydrogen content facilitates its control and hence limits the porosity of castings.

English Steel Corporation Limited (stand 30).—On this stand, the firm traces, by means of photographs, its early beginnings, dating back to 1855. The firm stresses the importance of apprentice training by exhibiting prize-winning entries submitted by English Steel Corporation foundry and patternshop apprentices for the apprentice competition.

F. & M. Supplies Limited (stand 27).—This company manufactures a wide range of scientifically developed and controlled foundry products, comprising ferro-alloy briquettes, core binders, core adhesive, parting powder (non-silica) and liquid parting (P.L.P.), plastic stone, iron cement, feeder-head compound, fluxes for non-ferrous metals, and other materials for use in ferrous and non-ferrous foundries. The exhibits will include castings, cores, patternplates, etc., made with the company's products and displayed by courtesy of some of the foundries where they are in actual use. Laboratory and technical staff are available on the stand to discuss foundry practice and problems.

Fel-Electric Limited (stand 14).—The firm has endeavoured to show as wide a variety of crack-detectors as space will permit, from their latest addition, a small self-contained portable unit, up to one of the well-known universal machines designed for rapid inspection of a wide variety of components. One or two representative models from the demagnetizer range are shown but these are usually made up to order, having an aperture to suit the customer's components. Of the full range of magnetic, fluorescent magnetic and non-magnetic crack-detecting inks shown, emphasis is laid on the new H.C. or concentrate, on view this year for the first time, and which can be supplied in black, red or yellow.

Firth-Vickers Stainless Steels Limited (stand 20).—The development of new alloys, having superior corrosion-, heat- and creep-resisting properties in the cast form has enabled many industries to solve their high-duty design programme by the use of castings. The following methods of supply are available:—(1) precision-investment castings, supplied to close tolerances in the firm's special steels for the aircraft industries, food, chemical, textile and optical engineering; (2) sand castings in both green- and dry-sand for many high-duty applications in a wide variety of industries, and (3) centrifugal castings in both permanent and refractory moulds for service under the most exacting conditions such as the aircraft industry where high strength, reliability and perfect soundness are essential.

Foundry Services Limited (stand three).—The exhibit will be divided up for easy reference into sections as follow:—steel ingots, iron and steel castings, non-ferrous castings, light-alloy castings, coatings and other products, and technical service. Details will be shown of individual FOSECO products applicable to each section. In addition, the firm's technical service and sales personnel will be in attendance to answer any queries and to advise on any casting problems.

Hadfields Limited (stand one).—One of the largest steel foundries in the world is represented here by steel castings in carbon, low-alloy, and manganese steel, heat and corrosion-resisting qualities in a wide range of types and sizes up to 30 tons in weight. The methods employed include floor moulding, machine moulding, shell moulding and precision casting by the lost-wax process. Castings which are on exhibition include some for use by the aircraft industry, and photographs illustrate the nature of some of the heavier castings and also one of the moulding bays.

Hepburn Conveyor Company, Limited (stand six).—The Clearfield sand muller-mixer on exhibition is one of a range which the firm is making under a royalty from the designers in America, from 2 ft. 6 in. to 9 ft. dia. These machines are arranged with a revolving pan with muller or mullers performing the tempering operation and incorporating a star-shaped agitator to avoid the building-up against the centre hub or packing in a hard layer at the bottom of the pan as a result of the muller pressure, thereby creating aeration of sand.

Also on view is the P.C.F. metal ladle, embodying features of a first-class character and complying with the requirements of all foundrymen looking for a means of carrying and handling metal for either lip or bottom-pouring with safety. The construction embodies gearing in oil baths, with anti-friction bearings.

A simple pallet conveyor unit, "Normad," designed particularly for the handling of moulding boxes, and especially flask moulds, can be seen. When moulds only are required to be handled, there is available a simple air-operated dumper unit which receives the pallet and mould, tips into a receptacle or on to knock-out grid, returning the pallet empty to the point of the moulding machine. The pallets are carried on three or four ball-bearing fitted, specially treated, non-rusting double-flanged rollers, and the standard pallet is of special non-burning aluminium alloy.

The firm have recently been appointed sole manufacturers and distributors in most countries outside USA and Canada of the Pangborn shot-blast cleaning and dust-collecting equipment.

Holman Bros. Limited (stand 10).—All Holman compressors are two-stage but, incorporating the well-proven differential piston design, and automatic valves, they are extremely simple and have a minimum number of working parts. Model "ATH8S" exhibited is the smallest of the range. It has an output of 68 cub. ft. free air per min. at 100 lb. per sq. in. and is air-cooled. One of the chief uses of compressed air in foundries is in the fettling shop and Holman pneu-

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matic tools employed for this purpose are exhibited. The chipping hammers are available in several sizes ranging from 7 to 14 lb. in weight. A suitable size may therefore be selected for dressing any castings—from the most delicate to the heaviest. Rotogrinds are portable grinding machines of either radial or surface type. They are powered in each case by vane-type air motors incorporating special features. Radial models are available in speeds (on load) from 15,000 to 4,000 r.p.m.

Honeywell-Brown Limited (stand 28).—Both circular-chart and strip-chart models of the Brown electronik potentiometric indicating and recording instruments are exhibited. With a response speed of 5½ sec. for full-scale travel, these models are specifically designed for use in connection with accurate temperature measurement of molten metal. Suitable thermocouples and accessories are included. The Brown, high-speed multipoint electronik recorder, incorporating synchro balance-type printing, is also included, representing an up-to-date means of rapidly recording various temperatures.

A. Lakin & Son Limited (stand 16).—This firm are agents for Adaptable moulding boxes and Talbard rolled-steel moulding boxes and on exhibit will be Standard and Squeeze machines, both made in two sizes and adaptable for varying widths of patternplates; Duplex machines—two in one—all built to close limits; Talbard boxes from 8-in. by 2½-in. deep each part, fixed pin and loose-pin types, with all female lugs fitted with steel bushes, all jig drilled and interchangeable. Sundries include:—chaplets and studs, chills and denseners, ladles, tongs, foundry nails and sprigs, skimming gates, dowels of all types, pattern letters and figures and rapping plates.

Laycock Engineering Limited (stand 11).—The majority of castings made at the Laycock foundry are the basis of many precision-machined Laycock products. These, while seeming small to many Sheffield founders, are often extremely intricate and have to be cast with the highest degree of skill. An example of this is exhibited in the compressor cylinder head, shown from pattern stage to fettled casting. In all stages of this particular product, the most efficient foundry methods were put into practice. The patterns were most skilfully made to ensure perfect cores and moulds and in turn to cut down fettling to the barest minimum. Other exhibits include castings used in Laycock railway and garage equipment, and the rear casing in aluminium for the famous Laycock-de Normanville overdrive.

William Lee & Sons (stand 22).—The range of malleable-iron castings exhibited contains representative examples of types produced for the agricultural, motor, electrical, textile, mining, general engineering and other industries. Striking and outstanding features are the sharpness and clean appearance of these castings, which are notably true to size and design and excellently finished.

In company with these characteristics, consistency of quality is guaranteed—castings will be found to be readily machinable at all times. whilst the ductility and toughness expected of malleable-iron castings is still preserved. Capacity is available for any quantity of castings between one and a million.

Luke & Spencer Limited (stand 34).—The new Iron and Steel Foundries' Regulations, which came into effect in January of this year, have caused many foundries to have second thoughts regarding the efficiency of dust extraction in their fettling shops.

On stand 34 can be seen a 16-in. dust-exhausting, swing-frame grinder and a 24-in. Duplex floor grinder. The former is powered by a 7½ h.p. motor and weighs just over 500 lb.

The 24-in. Duplex floor grinder is exceptionally robust. It has an independent 3-speed drive to each wheel, and is specifically designed for continuous heavy duty in the foundry. Newly designed wheel-hoods and slotted work-rests are fitted and the grinder is connected to a motor-driven cyclone separator of 1,800 cub. ft. per min. capacity. Similar machines with wheels of 16, 20, 30 and 36 in. dia. are also manufactured.

Markham & Company, Limited (stand 32).—The manufacture of heavy and medium general-engineering products is undertaken at the works of Markham & Company, Limited, and special constructions in both mechanical and structural engineering, including water turbines for the large hydro-electric power schemes, winding engines, surface plant and other capital equipment in the development of new mines and the reconstruction of existing mines. Some of these products are illustrated by photographs, in their various manufacturing stages, either as separate units or being built up into comprehensive machinery assemblies. The firm's works at Broad Oaks are equipped with modern tools, and experienced technicians successfully arrange designs for the manufacture of almost any kind of equipment in the appropriate metals, coming within the range of heavy general engineering.

Martonair Limited (stand 29).—Martonair Limited are exhibiting part of their large range of pneumatic equipment. The principal demonstration is a Martonair hoist which embodies several special features which will be of interest to foundry engineers, including the balance effect whereby the load can be raised or lowered manually several inches without recourse to the control valve. Maintenance of the hoist is low and operation is possible in conditions unfavourable to other types of lifting equipment; many safety features are incorporated. Also shown is the Martonair hoisting arm, similar in principle, which enables loads to be picked up and lowered over a large area whilst occupying minimum headroom. Other exhibits include part of the range of valves and cylinders, together with a working demonstration of the Safety Servo press.

Modern Furnaces & Stoves, Limited (stand 31).—Newstad oil-fired and gas-fired portable mould dryers, specially designed for foundry use, will be exhibited. These units are fully portable and meet all the requirements of the new regulations regarding foundry conditions. The oil-fired unit delivers 600 cub. ft. of hot air per min., with a temperature range of 200 to 500 deg. C. The gas-fired unit delivers 500 cub. ft. of hot air per min. with a temperature range of 200 to 450 deg. C. Vortex gas and oil-fired ladle dryers, made in four sizes and catering for ladles from 5 cwt. to 25 tons capacity, are on show. The oil-fired dryers are supplied in two standard sizes for ladles of 1 to 25 tons capacity. Larger sizes can be supplied.

Newton, Chambers & Company, Limited (stand 13).—This exhibit illustrates products of both the heavy and light casting departments of the company, and will also feature examples of the craft training given in the apprentice training schools. The light-castings department will illustrate the method of shell moulding chrome-steel boilers and will also display typical small castings, manufactured for various industries, which have been machine moulded in the modern fully-mechanized plant at Thorncliffe. This department will

also display the new Redfyre open convector fire, which is assembled from components made in the light castings foundry. The heavy-castings department are displaying special finned tubes in heat-resisting cast iron. These are machine moulded by special methods and used extensively in the industrial fuel-economy field, principally in recuperators, economisers, and airheaters. Also displayed are heat-resisting castings for the gas and chemical industries. The training-centre display will feature examples of foundry apprentice craft. Typical models made by the boys at the apprentice centre will be displayed, and there will be a photographic background showing craft training.

Osborn Foundry & Engineering Company, Limited (stand eight).—Here, a working scale-model of a melting bay in a steel foundry depicts the melting of steel in an electric arc furnace, and the pouring and casting of liquid steel in the moulds. Castings displayed are supplied to the oil-refining industry, manufacturers of excavating and earth-moving equipment, collieries, cement and brickworks plant. These castings are produced from a comprehensive range of cast steels manufactured by this company, including carbon, low-alloy, manganese, stainless and heat-resisting steels. Castings by the precision methods of the shell-mould and Osborn Shaw processes are also shown, and include components for the engineering, electrical, chemical, steel, metallurgical, aircraft and dairy industries. Information of interest to young men contemplating entering a foundry as a career on leaving school is given, including details of the Osborn apprentice scheme which comprises a comprehensive blend of practical and theoretical tuition. Successful completion of apprentice training is acknowledged by the award of a Craftsman's Certificate, and advanced training facilities are available, leading to technical, commercial and managerial positions.

G. Perry & Sons Limited (stand nine).—Exhibition of wood and metal pattern equipment illustrated by actual patterns and photographs, which include pine and mahogany patterns, precision metal pattern equipment (particularly as used by the motor industry), including machined patterns, coreboxes, foundry fixtures, etc. Pressure-cast patternplates both single and double-sided matchplates are also on show. These plates are made in this firm's own pressure cast foundry. Photographs are shown illustrating wood and metal patterns being made on a wide variety of machines.

W. Pickard & Company, Limited (stand 24).—W. Pickard & Company, Limited, will show a range of finishes for foundry patterns designed to illustrate the best type of finish for any moulding method. To enable the pattern to be lifted cleanly from the mould, the surface of the pattern must be coated with a paint or varnish that will not adhere to the sand. For many years, the application of a coat of shellac enamel or varnish has been the standard practice but the introduction of new methods of moulding—resin sands, sand slinging, CO_2 moulding, etc.—have necessitated the use of new pattern finishes that are more resistant than shellac. Wood and metal patterns finished in various ways to illustrate particular properties of these enamels will be exhibited.

Pneulec Limited (stand 18).—This company has chosen sand-preparing plant as representative of its line of foundry-equipment manufactures. The Pneulec Royer may be used either as a single unit (complete in itself, and fed by shovel) or built into a continuous sand-preparing plant. In this exhibit, it is fed by a portable conveyor unit, having a knock-out grid and receiving hopper at the tail end. The belt delivers sand, over a magnetic head pulley, into the machine, tramp iron being removed by the magnetic head pulley and delivered down the scrap chute. Thus, scrap is removed before sand enters the machine, where it could cause damage to the combing belt.

Renishaw Iron Company, Limited (stand 12).—The firm's total output of pig-iron is used throughout the British Isles in the production of all classes of castings, such as light and heavy engineering castings, téxtile machinery, stove, grate, and electrical, and for castings requiring vitreous enamelling. Different grades and analyses can be supplied to suit all types of castings, and strict laboratory control enables supplies to be selected to suit customers' specifications. Products of special interest include slag ladles, firebars, ingot moulds, and furnace castings in hematite and heat-resisting irons. Castings are supplied to collieries and power-stations from a few pounds to 5 tons. Another speciality is die-cast iron rod—any size from 1 to 12 in. dia.

Rotherham College of Technology (stand 42).—The disc sander on stand 42 was designed by students in the mechanical engineering department of the Rotherham College of Technology under the guidance of a full-time lecturer in charge of patternmaking. The drawings were made and machining tolerances decided by students taking the National Certificate Course, whilst the patterns were produced by part-time day students preparing for the City and Guilds Certificate in Pattern-making. The castings were produced by foundry apprentices in the training departments of Davy & United Engineering Company, Limited, and Newton, Chambers & Company, Limited. All machining, fitting and assembling were carried out by students in the College machine shops and the final painting was the work of students of painting and decorating at the Rotherham School of Arts and Crafts. This is a first-class foundry job made by many students and they are all justly proud of this achievement. Foundrywork of this type is continually in progress at the College.

Ridsdale & Company, Limited (stand 23).—A complete range of laboratory equipment suitable for preparing and testing green-, dry- and core-sands is exhibited. This includes the Ridsdale-Dietert moisture teller, permeability meter, dead-weight universal testing machine with motor drive, for determining compression, shear, tensile, transverse, and deformation strength, mixer, mill, core-baking oven, test sieves and mechanical shaker, and hardness testers. Of special interest is the Ridsdale design shatter-index tester for determining the toughness or mouldability of a sand; and a perforated corebox base for blowing CO_2 tensile test specimens. A catalogue illustrating this equipment is available on request.

Colin Stewart Limited (stand 17).—On view on this stand will be a range of British-made bonding clays for all classes of foundrywork; ground chamotte for use as a necessary refractory material for investment or lost-wax castings and for mould facings; wet and dry silica flour in many grades for use as an addition to moulding sand or as a fine refractory in paints for moulds and cores; ground quartz and white bentonite for vitreous-enamelling frits; and parting powder. Free technical service and samples are available.

Yorkshire Electricity Board (stand 21).—The equipment shown demonstrates methods of controlling factory load by automatic and manual operation, including the benefits to be obtained by the instalaltion of power-factor correction equipment. Typical factory load curves are exhibited which show how advantage can

be taken of the variations in the curve during the day. An advice bureau is incorporated and the staff in attendance will be pleased to give advice on all electricity supply matters.

A. B. Ward (Bookseller) (stand 44).—On this stand will be a large selection of technical books and papers together with helpful advice resulting from 27 years' experience. Apprentices and workmen are particularly invited to come and see the wide range of books, many of which have been specially written for them. Technical books are very suitable for presents, they are always useful for reference and they can be of considerable help to practical industrial workers. Special attention is given to the requirements of all types of students and extensive stocks are carried for continuation and evening classes, for apprentice awards and for works and trade training schemes.

Thos. W. Ward Limited (stand 37).—The theme of this stand is "Safety for the Operative." A range of industrial safety boots and shoes, with steel toe-caps, is on show. These have nailed leather or Commando-type rubber soles and an interesting feature is that each pair of boots or shoes carries a free insurance policy. Also on view is a comprehensive range of goggles, respirators, face masks, gloves and gauntlets, leggings and asbestos clothing.

Association of Bronze and Brass Founders (stand 41).—The Association of Bronze and Brass Founders is a national organization formed to promote and protect the interests of copper-base alloy founders. Since 1942, it has represented the industry in dealing with the Government, other associations, national bodies and on committees of the British Standards Institution, the Institute of British Foundrymen, Recruitment of Training and Education Boards. Members receive advice on problems both commercial and practical and an able committee deals with technical matters such as specifications, the maintenance of quality, the dissemination of knowledge of the properties and uses of alloys, information concerning processes and procedures. Close liaison is maintained with the British Non-Ferrous Metals Research Association. Much work is being done which will ensure excellent, safe and healthy working conditions in non-ferrous foundries. Most of the leading engineering brass and bronze founders are members of the Association and, as its work benefits members and non-members alike, it is receiving increasing support from firms in the industry.

Incandescent Heat Company, Limited, and Associates (stand 42a).—The exhibits include models of an Incandescent-Whiting twin cupola with swivel charger, a Metalectric direct-arc steel-melting furnace installation, manufactured in capacities up to 100-tons, and a large oil-fired bogie hearth annealing furnace. Other equipment, depicted by photographs, show the most modern foundry techniques, including mould and core baking ovens and dust-extraction equipment; Metalectric-Calamari low-frequency induction melting furnaces and dielectric core-baking units; Selas melting and burner equipment and other melting and heat-treatment units. Also illustrated are some of the furnaces the group has installed for such processes as cycle-annealing, malleablizing, stress-relieving and treatment of spheroidal-graphite iron.

Millspaugh Limited (stand 40).—The centrifugal casting plant at the Alsing Road works of Millspaugh Limited, is believed to be the only one in this country, in fact only three such foundries are known to exist in the world, equipped for the production of a range of castings up to 25 tons in weight in sizes up to 30 ft. long and 60 in. diameter. Continuous improvement and development is sought in conjunction with Hadfields Limited, whose research facilities are made use of. The main applications of these spun castings are to be found in the following fields:—suction-roll shells for paper-making machines, tail-shaft liners for ships, and tubes, rings and flanges for the oil and chemical industries.

A Meeting Place

It is expected that many of the visitors to the exhibition will make a meeting place of the stand of the FOUNDRY TRADE JOURNAL (number 43). Here they can discuss common problems, the pros and cons of this or that plant or equipment and arrange rendezvous with their friends. Staff from the JOURNAL will be on hand to make visitors welcome and assist in any way possible in an informal manner—at the very least, visitors will be able to "take the weight off their feet" for a few minutes.

It may be germane in this context to remind readers that the FOUNDRY TRADE JOURNAL, first published in 1902, is the only weekly journal in the world serving this vital branch of the metallurgical industry. As the official organ of the Institute of British Foundrymen for more than 50 years, it has worked in the closest possible association with the Institute. It has always been renowned for its up-to-date news of the industry and its personnel, combined with accurate and informed comment on technical progress and the development of new processes. A measure of its achievement is registered by the fact that, of every thousand copies printed, 407 are sent to subscribers in 48 different countries. Its help and advice is sought and given in countless ways and it has always played a major part in the education of the younger technician.

UK Engineering Prices Rise

Index for the terms of trade for the UK (the ratio of import prices to export prices) remained unchanged at 97 for September, as both import and export price indexes rose by one point (104 and 107). Engineering export prices rose by one point to 109 (average 1954=100) and represents an advance of 3½ per cent. on the average of the second quarter of this year.

The biggest decline in exports in September was also in engineering products, the sector most buoyant in the early part of the year. The biggest falls in imports were in basic materials and fuels. Both contributed to the lowest recorded levels since September, 1954 (apart from months affected by dock strikes). The decline recorded in August continued, though only slightly on the daily rate basis.

The monthly average of exports in the third quarter—£247,200,000—was nearly 7 per cent. lower than the rate in the first half of the year, a fall, says the Board of Trade, greater than could have been expected on seasonal grounds alone. The monthly average of imports in the third quarter was 5 per cent. lower than the average for the first half year.

SHELL CHEMICAL COMPANY, LIMITED, have appointed Foundry Services, Limited, Long Acre, Nechells, Birmingham, as their sole and exclusive distributor of Shell I.P.S.1 and I.P.S.2 Isopropyl alcohol to the foundry industry in the United Kingdom and Republic of Ireland as from November 1.

Hydrogen in Steel

Hydrogen may cause several types of defects in steel, and its presence in the metal is said never to be beneficial. Indeed, hydrogen is unique among alloying elements in that it reduces the ductility of steel without increasing its strength. Fortunately, the amounts of hydrogen retained in many grades, from steelmaking operations, do not cause commercially important defects. However, it may cause significant defects in killed steels used for fabrication into heavy sections. In general, the occurrence of hydrogen-caused defects is greater in alloy than in carbon steels. Mr. E. R. Slaughter, Battelle metallurgist, reported the following four principal defects in steel by hydrogen to the operating-metallurgy session of the recent National (American) Open-hearth Conference, as follow:

Porosity. Hydrogen, which is more soluble in liquid steel, tends to be rejected by the metal as it solidifies. As a result, a part of the hydrogen present may be liberated as gas, to cause blowhole-type porosity or to aggravate centreline shrinkage. Hydrogen can cause porosity in steel castings regardless of composition, but it is particularly troublesome in high-chromium grade ingots.

Flaking. Flakes are ruptures in massive steel billets, forgings, or rolled products which are caused by hydrogen in the presence of thermal or transformation stresses. Stresses must exist in the steel for a period ranging from several hours to more than a day while the metal is below 205 deg. C. in order to cause flaking. Steels with greatest hardenability are most susceptible to flaking.

Loss of Ductility. This defect, also known as hydrogen embrittlement, may affect all ferritic steels and, to a lesser extent, austenitic steels. Hydrogen, in this, as in the case of flaking, is introduced during the steelmaking operation or during pickling and electroplating.

Delayed Brittle Fracture. These fractures are encountered in steel parts heat-treated to more than 80 tons per sq. in. ultimate tensile strength. They occur when parts are subjected to static loads far below the yield point and after delays of several months. It is generally agreed that hydrogen is necessary for the failures to occur, and that it is introduced from plating or pickling operations.*

*That pickling is responsible for hydrogen embrittlement is not invariably conceded in this country, where there are increasing requests for steelfounders to undertake pickling of sizeable steel castings for scale removal and to disclose hidden defects—EDITOR.

American Shell-moulding Progress

An article in *Iron Age*, by Mr. O. W. Winter of Beardsley & Piper, Chicago, states the sale of resins for the making of shell moulds amounted to 4,460 tons last year and is expected to be of the order of 6,700 tons this year. The anticipated consumption in 1960 is thought to be in region of 22,000 tons. Castings as heavy as 7 cwt. are now being regularly made, whilst others—crank shafts for example with a 2½ in. section—weigh 60 lb. The article stresses the advantages of steel shot as a backing instead of sand or gravel when making heavy castings. The tolerances cited are from + 0.003 to + 0.005 in. per inch between mould sections, but across parting lines, when using liquid resins, they are of the order 0.005 but rise to 0.07 in. when solid adhesives are used.

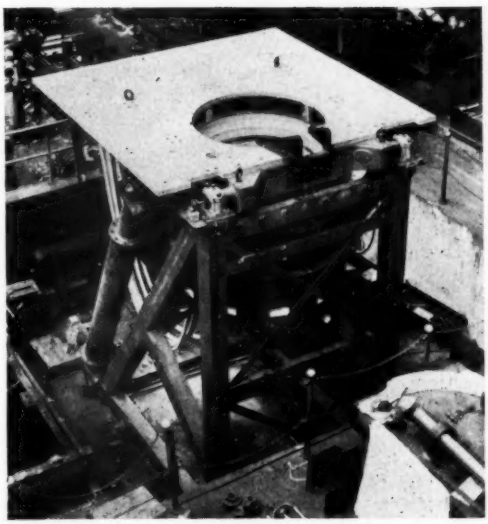
Future of Volkswagen

It is difficult to see how a car factory could become "a political football in a game of economic power politics"—yet that is the fate of the Volkswagen factory at Wolfsburg, near Hanover, unless it is turned into a private enterprise concern, according to its general manager, Dr. Nordhoff. "Volkswagen" is German for "people's car," which, in fact, it was when the enterprise was started in pre-war days with Hitler's blessing, and it was, and is still, a very large and highly successful engineering concern. It started life as a government affair and after the war the patents, designs, and such of the plant as was overlooked by the RAF, were offered as reparations. There were no takers and operations were restarted at Wolfsburg under the aegis of the Control Commission; when it departed, the concern was vested jointly in the Federal Government and the Government of Lower Saxony.

To-day the future of the factory is being heatedly discussed. Should the company be floated as a limited liability company and, if so, how much authorized capital should be allotted? Dr. Nordhoff recommends the floating of a company with a capital of between DM250,000,000 and DM400,000,000 (about £25,000,000 to £40,000,000) as the happiest solution of the future of the enterprise. Coventry's greatest concern will probably be whether the people's car will be able to insinuate itself into the proposed European "free-trade" market.

Coreless Induction Furnace for India

Birlec mains-frequency coreless induction holding furnace of 5-tons capacity, under construction for Tata Engineering and Locomotive Works, Jamshedpur, India. Rated at 300 kw., it is capable of a melting rate of 8-cwt. per hour when operating on cast iron. An overhead view before lining shows the furnace body, frame, and hydraulic tilting cylinders. This furnace is believed to be the first of its kind to be exported from Great Britain to India.



British and World Shipbuilding

Lloyd's Register Returns for the September Quarter

Steamships and motorships under construction in Great Britain and Northern Ireland at the end of September totalled 333 ships of 2,077,976 tons gross, an increase of 49,844 tons compared with the previous quarter, states Lloyd's Register of shipbuilding returns relating to merchant ships of 100 tons gross and upwards. The vessels included 93 steamships of 1,125,210 tons and 239 motorships of 952,616 tons. In other British Commonwealth countries there were under construction 15 steamships of 39,583 tons and 45 motorships of 86,921 tons. Oil tankers building in Great Britain and Northern Ireland totalled 58 ships of 842,564 tons, an increase of 9,263 tons compared with the previous quarter. The present figure represents 40.5 per cent of the total tonnage under construction in this country. Vessels building in the world numbered 1,501 of 7,449,310 tons (including five wooden ships of 615 tons), compared with 1,534 of 7,223,004 in the June quarter. The total included 274 steamers of 3,238,779 tons and 1,222 motorships of 4,209,916 tons. Construction in hand in the principal districts of Great Britain and Northern Ireland is indicated in Table I.

TABLE I.—*Vessels Under Construction in Principal Districts of Great Britain and Northern Ireland.*

District.	September 30, 1956.		June 30, 1956.		September 30, 1955.	
	No.	Gross tonnage.	No.	Gross tonnage.	No.	Gross tonnage.
Aberdeen ..	18	20,935	19	21,204	22	26,974
Barrow ..	4	93,070	3	71,930	4	86,412
Belfast ..	18	210,050	19	206,170	21	240,140
Bristol	4	2,666	4	2,717	4	2,430
Clyde:						
Glasgow ..	76	447,993	70	419,750	70	437,032
Greenock ..	29	184,421	28	187,745	31	197,245
Dundee.. ..	5	36,210	6	44,410	4	28,410
Hartlepool ..	7	49,590	7	47,350	8	46,371
Hull	34	19,483	38	21,092	37	19,095
Leith	11	53,160	13	57,916	17	58,954
Liverpool ..	19	156,414	21	162,168	17	142,143
Middlesbrough..	14	177,300	15	198,400	13	204,173
Newcastle-upon-Tyne ..	36	393,251	34	372,589	37	390,044
Southampton ..	4	3,570	3	646	5	2,556
Sunderland ..	29	217,406	28	202,806	33	253,040

The sizes of steamships, and motorships in parentheses, under construction in Great Britain and Northern Ireland included the following:—100 to 1,000 tons, 13 steam (99 motor); 1,000 to 2,000 tons, 1 steam (20); 2,000 to 4,000 tons, 3 steam (15); 4,000 to 6,000 tons, 3 steam (15); 6,000 to 8,000 tons, 11 steam (42); 8,000 to 10,000 tons, 13 steam (34); 10,000 to 15,000 tons, 16 steam (14); 15,000 to 20,000 tons, 7 steam (1); 20,000 to 25,000 tons, 22 steam (nil); 25,000 to 30,000 tons, 3 steam (nil); 30,000 tons and over, 1 steam (nil).

Of the steam and motor merchant ships under construction throughout the world at the end of September, 4,518,555 (60.7 per cent.) are under the inspection of Lloyd's Register. Of this total, 2,002,765 tons, representing 96.4 per cent. of the tonnage being built there, are under construction in Great Britain and Northern Ireland, while of the tonnage being built abroad, 2,515,790 tons (46.8 per cent.) are to be classed with Lloyd's Register of Shipping.

BENNIS COMBUSTION, LIMITED, Manchester, announces that from November 1 its sole representatives for Scotland are Engineering Agencies, Atholl Works, 190, Rumblingwell, Dunfermline.

Foundry Health Investigation

Birmid Industries, Limited, has announced that it intends to make it a condition of service at its Smethwick foundries that all employees shall have regular X-ray examinations. New workers joining the company will have to agree to this before being engaged and present employees will be asked for their co-operation in undergoing medical tests. New X-ray equipment is being installed with the object of investigating the effect of foundry dust on operatives and the extent to which the working conditions of the foundry industry are responsible for chest diseases.

In a statement, the company says that although previous tests have not so far supported allegations made against health conditions in the industry, the management wishes to obtain a complete answer—"It is a disquieting fact that dust diseases have cropped up in unexpected places and we do not know whether or not these diseases were acquired before entry into the employment of the company nor do we know whether certain individuals are more susceptible than others." With the new equipment the company hopes to keep track of suspected cases of disease among employees. By coding X-ray photographs into groups representing age, employment, previous occupational history, it is hoped to analyse the occupational risks, if any, of foundrywork.

The scheme is being inaugurated in co-operation with the medical departments of the Ministry of Labour and the Factory Inspectorate. The code system will make it possible for the company to supply those departments with information without disclosing names or personal details of employees concerned.

Galvanizing of Cast Iron

A Report issued by the Technical Information Service of the National Research Council, Ottawa, makes the following reference to the galvanizing of cast iron:—

Cast iron, unless malleable, is much more difficult to galvanize than wrought iron. Common cast-iron is treated in the following manner to prepare it for galvanizing: boiling in hot soda solution, pickling in warm sulphuric acid of 20 per cent. strength, dipping in lime water, barrelling in weak acid, then in cold water to remove the superficial deposit of graphite, short boiling in zinc chloride solution, and drying. If a great deal of graphite has been exposed by pickling, it is removed by boiling again in potash or soda lye. Malleable cast-iron offers no difficulty to the galvanizer but may become embrittled if it contains much phosphorus and silicon. Slow cooling improves the properties of the casting

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Scottish Clean Air Council

Sir Patrick Dollan reported at a recent meeting of the Scottish Fuel Efficiency Committee that the Department of Health for Scotland had formed a Clean Air Council for Scotland. Their duties would consist of supervising the operations of the Clean Air Act, and to make recommendations to the Department on policy. They would also have under consideration the date on which the Act will become operative in Scotland.

A number of local authorities, including Glasgow, Edinburgh, Motherwell, and Greenock, were going ahead with plans for smoke-free areas. It was expected that one large Glasgow housing scheme at present under construction would have no coal-burning fires installed, and that power would be provided by either gas or electricity.

Developments and Current Trends of British Shell-moulding Practice*

Discussion of Mr. D. F. Bailey's Conference Paper

Following the Author's introduction of his Paper—during which new illustrations were introduced—a practical and lively discussion ensued. Applications of shell-moulding versus *green-sand moulding and the CO_2 Process are discussed, including the possible overlapping of one method with another. Other matters considered included the difficulties and inconsistencies encountered with coated sand, occurrence of resin segregation and the removal of traces of solvent when preparing coated sands. Questions and answers are given on running, gating and feeding methods for the shell-moulding process, and costs compared with the more conventional sand-moulding methods. Written contributions are included on the subjects of sand particle-size determination and shell assembly to which Mr. Bailey, with the help of further illustrations, gives comprehensive replies.*

Opening the meeting at which the Paper "Recent Developments and Current Trends of British Shell-moulding Practice" was presented by D. F. Bailey, the chairman (Dr. A. B. Everest) said many members would recall the fact that it was Mr. Bailey who had gained the Jubilee Award of the Institute in 1954 for his Paper on "Some Aspects of Shell-moulding Technique," and that Paper had been very well received and was presented to several of the branches. Mr. Bailey wished it to be emphasised that although he was with Bakelite, Limited, he was essentially a foundryman and not a resin chemist, so he would decline to answer any questions about the deeper aspects of resin chemistry.

Introduction

In presenting his Paper, MR. BAILEY said he was sure members would appreciate that development and knowledge of shell methods had grown so rapidly and diversely over the past few years that it was beyond a single individual to be personally familiar with every aspect. Should members feel that something of particular interest had been omitted or scantily dealt with owing to personal limitations or lack of space, he offered his apologies. In view of the fact that the shell process was "oversold" initially and some prejudice created through exaggerated claims, particularly regarding "machine-shop limits," he took the opportunity to stress that nothing in this Paper was intended to infer that the process would perform miracles.

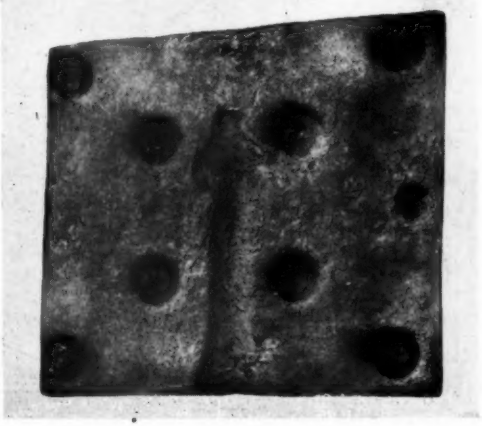
Cores

In this field, coated sand had mainly superseded dry, powdered mixes. Whilst it had been generally agreed that shell cores were suitable for heavy metals, it was feared until recently that the break-down problem with phenolic resins would restrict application in the light-alloy field. The introduction of coated sand had now promoted a new approach to this problem, as by virtue of its greater flowability, cores could be made much thinner than was possible with a powder mix. Being thinner and therefore having less heat-capacity, the phenolic resin bond was usually broken down to a sufficient extent that the core was readily knocked out; also, material and production costs were lower.

Mould Blowing

Mr. Bailey said he felt at the present time that the key to the future for mould making might well be some form of blowing. With due respect and acknowledgment to machine makers, he thought the dump bucket was a "thief" of time and would have to be eliminated if substantial outputs per machine were to be achieved. With blowing methods, a more economic approach could be envisaged, as it should be possible substantially to lower the resin content and at the same time appreciably increase the output per machine. The shape and thickness of the back of the shell could be designed so that low-resin-content mixes could withstand the prolonged "liquid life" of heavy

FIG. A.—*Half-shell made on a dump-bucket machine; by changing to a blowing method, the need for grinding the tops of the clamping bosses parallel with the joint face would be eliminated.*



* Paper printed in the JOURNAL, June 28, 1956.

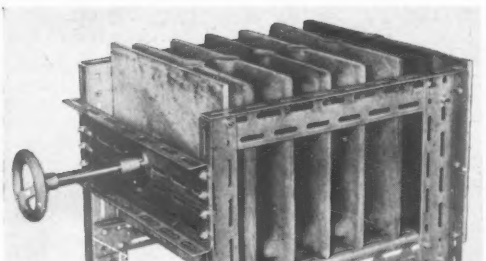


FIG. B.—*Clamping frame developed for the assembly of shell moulds for pouring.*

sections. Also, as the back shape of the shell could be accurately controlled, it should be possible in many cases to simplify mould assembly and eliminate the necessity for adhesives, etc. For example, the method developed by Mr. T. H. Weaver, where shells (Fig. A) were clamped in a long frame, would become much more attractive as it would not be necessary to grind the clamping pads (Fig. B) to height. With suitable projections, certain shells could be held together by ordinary foundry weights for casting.

If these considerations of greater machine output and lower labour and material costs were realized, the economics would be such that shell moulds would have more application than they have to-day. For die-casting and centrifugal casting of the heavy metals, the blowing of a sand facing on to a permanent mould in a similar manner to blowing a core round a former would seem to be a logical field for investigation.

Coated Sand

Two methods of making coated sand were in current use: the hot-melt process and the cold-solvent process, and it was not possible yet to say which (if either) was the better method. If hot sand was available, the hot-melt method, using standard equipment, was the fastest (approximately 12 to 15 min.) and produced a completely free-flowing material which would not consolidate on standing. Mixing by the cold method could, with standard equipment, take as long as 30 min. before complete removal of the solvent, unless special provision was made for a forced draught of warm air. Removal of the last traces of solvent could be a difficulty and incompleteness of removal caused the material to consolidate on standing. On the other hand, a small degree of consolidation could be useful in preventing sand run-out from blowing holes. When the last traces of solvent were removed the material would not further consolidate.

Another method described in the Paper—where a small quantity of liquid resin is first mixed with the sand to give the grains a sticky surface and an addition of powdered resin is made—was being tried experimentally but was not yet in production. A very important feature of coated sand was that it could be 60-80 per cent. more permeable than when the same resin content was in powder form (See Fig. C (a) and (b)). To what extent coated sand would be made-up in foundries in comparison to that bought from trade suppliers only time would show.

Runner Systems

No comment was necessary on the general material of this section of the Paper, but, in passing, the Author expressed a personal opinion regarding the procedure for developing a satisfactory runner system. It was an exhortation for the shell-mould designer to be familiar with the technical requirement and any past experience or data on similar jobs, but from then on, according to the prevailing condition, it was a case of "development by experiment."

Shell Assembly and Backing

No single method had yet been developed which was universally acceptable for all circumstances and conditions of shell assembly. Synthetic-resin

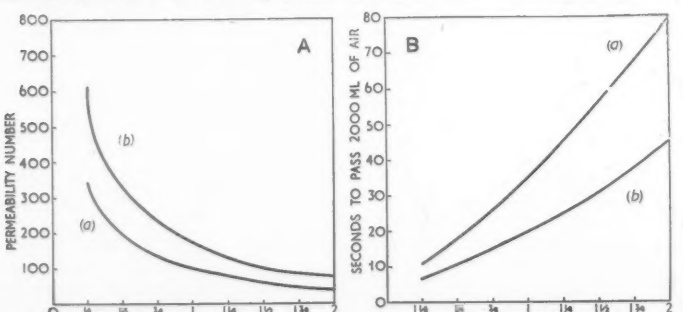
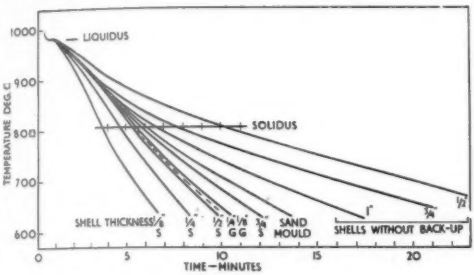


FIG. C.—*Permeability of a powder-mix shell-moulding sand compared with a pre-coated mix and expressed* (A) *as a standard permeability number and* (B) *as the time to pass* 2,000 *ml. of air.*

(*Courtesy, Mr. T. H. Weaver.*)

Key: Mix (*a*) is powder sand/resin mix and (*b*) coated mix, both using 50 F.G. sand and 5 per cent resin content.

adhesives now predominated and to bring about hardening, some heat source was required. When the heat source was the shells themselves it was preferable—for shells above 12-in. long—that both shells should be at the same temperature, if contraction stresses were to be avoided. Whilst the price of a liquid urea-resin adhesive was half that of a powdered phenolic, it should have been added in the Paper that, weight for weight, a powdered



(Courtesy, Mr. T. H. Weaver.)

Key: S = shot backing; G = gravel backing.

FIG. D.—*Cooling-rate graph for a gunmetal plate 1-in. thick, cast in backed and unbacked shell moulds of various thicknesses (after Morey, Bishop and Pellini).*

phenolic would assemble four times as many shells, so the final cost was the reverse of that based on initial cost of the material per lb.

Backing of shells is little practised in this country and, to the Author's knowledge, no mechanical handling plant existed in the UK for shot or gravel backing. Backing of special jobs to achieve a faster rate of cooling than was possible with an unbacked shell might well be on the increase, however.

DISCUSSION

Opening the discussion, MR. WEAVER said he wished to place on record his appreciation of Mr. Bailey's work. From a very careful study of the Paper, the Author appeared to be convinced that most of the doubts which had existed in connection with the production of castings by the shell-moulding process had been eliminated, but he had been pleased to note that in paragraph (3) on the first page of the preprint Mr. Bailey said he considered the process to be a special-purpose proposition, and therefore it would appear that it had still to be regarded as a process with a limited application. It was also very gratifying that the Author felt shell moulding was only supplementary to sand-casting production, and had issued the warning that the cost could be higher than conventional methods. In view of those considerations, the process was still somewhat of a controversial issue. However, the process had been established in the foundry industry, and with the many new technical approaches that had recently been made, it could be said with confidence that rapid progress with stability had been made.

Turning to green-sand methods, it should always be borne in mind the many years during which castings had been produced in that way, and providing the best equipment and technique was applied to that type of production, including automatic moulding machines, green-sand moulding would show greater advantages, particularly in the field of economics, and equal dimensional accuracy. Mr. Weaver said he would very much like to hear Mr. Bailey's assessment of automatic green-sand production relative to the limited application of shell moulding. Had sufficient development taken place in the blowing of shell moulds to make a definite statement such as it was possible to substantiate on shell coreblowing?

MR. BAILEY, in reply, agreed that it was still a limited process and the jobs had to be selected for it. Referring to Mr. Weaver's second point, which was the controversial issue, it was probably the same old problem that confronted one when introducing any new process: the people who were contemplating it had to ask themselves whether or not they were getting the best out of the methods they already had. The question of automatic green-sand moulding in relation to shell moulding was rather a difficult one—although very important—and he was unable to give a straight answer to it. It was a domestic issue and each foundry should weigh it up for themselves, one method against the other.

With regard to the blowing of shell moulds in relation to shell coreblowing, he was unable to substantiate that sufficient development had taken place—at least not to such an extent that production equipment was available immediately. From the pure research and development point of view, one knew what was wanted, but he did not think any British equipment existed as yet on a commercial basis to get mould blowing really going.

MR. CHALDER (Leicester, Lovell & Company, Limited) asked whether the Author had any information on the shape and size of sand grains and their influence on thermal shock in the shell mould.

MR. BAILEY replied that he had no such information.

Running Methods

MR. J. L. RICE (British Non-Ferrous Metals Research Association) said that this Paper had added considerably to the knowledge of shell moulding and the matters appertaining to it. He agreed with the Author that the principles of running and gating shell moulds were essentially the same as those for conventional moulding, except that it rather "begged the question" as to what were the satisfactory methods for conventional moulding. It was probably true to say that no radically different approach was needed where shell moulds were concerned, but he thought it was also true to say that shell moulds were more sensitive to unsatisfactory gating practice then were dry-sand or green-sand moulds; in other words, what one could "get away with" in the conventional methods one could not always do so in shell moulding, which was probably due to the difference in the cooling rate. He was

interested to see Mr. Bailey's design for a pouring basin, which represented a very novel approach to the question of using a runner or sprue which was incorporated in the patternplate and at the same time avoiding the reverse taper of a large diameter sprue which made it very difficult to maintain metal in the mould while casting.

He disagreed with the Author's statement that the CO_2 and the shell-moulding processes were not fighting each other for business. In his view, there were very many applications where in fact the two processes were in direct competition, and the field of oil coremaking which CO_2 made possible, and the greater accuracy in taking the hardened core away from the box (which was one of the advantages put forward in the case of shell), was also present in CO_2, another advantage being that it was possible to use the existing coreblowing equipment. One of the drawbacks was that with CO_2 one did have a lower strength, although in most cases that lower strength was adequate. Since with shell moulding it was the sand and the resin used which made it a rather specialized process, the obvious application seemed to be to use the blowing method of producing shells and a method of stack moulding, and in his opinion it was along those lines that shell could enlarge its field in the foundry industry.

At the beginning of his Paper, Mr. Bailey had mentioned that with shell moulding the overheads involved should be lower because specialized equipment was not required (such as cranes), and it would be interesting to hear to what extent such overheads could be reduced.

MR. BAILEY, in reply, said with regard to the two processes fighting each other for business, there was sure to be a margin of overlap where one did not know which was the best process to use, but for the majority of applications. if the people who had to make specific castings weighed up the merits of both processes under their own actual conditions it would become obvious which was the better process to use, and if one process was much superior to the other then there was no fight.

With regard to costing, he was not in a position to quote any figures of overheads from actual producers, and his definition of "accurate costing" would be as accurate as might be considered fair and reasonable under the particular conditions.

Difficulties with Coated Sand

MR. J. WORTHINGTON said the Author had covered a very wide field and there were certain points in the Paper which, mainly because of the wide field he had covered, he had made look too easy, particularly with regard to coated sand. The methods of coating which were dealt with did not explain that people who were using those materials did from time to time find one batch which invested at a far slower rate than another one, which had different strength characteristics and which could lead a particular foundry into a great deal of trouble due to cracking and troubles of that order. That being the case, it seemed that there was quite a lot in the process of coating sand about which we still had to find out, and it would be a good thing if Mr. Bailey could elaborate that point, because from his Paper there was a danger that people might perhaps coat sand by the cold process and run into quite a lot of trouble due to insufficient knowledge.

MR. BAILEY, in reply, agreed that there was a danger if people just read the Paper and then went off and tried to coat sand, because the practice they used had to be dependent upon the characteristics of the resin used. There were a number of resins used by different suppliers, and for detailed methods of operation when using those particular resins one was in the hands of the resin manufacturers. He was satisfied that the resins supplied to the foundry trade were consistent in their quality and if there was any inconsistency it was in the particular foundry. He honestly did not think the job was difficult, and if one did as one was told and carried out the resin manufacturers' recommendations he could not see where it was possible to go wrong. Some inconsistency could creep in, of course, if the material was milled for too long. In breaking down the coated sand from the rock-hard stage into the free-flowing material it was possible that some of the coating might be rubbed off the surface of the grains, and with a lower resin-content there might be some trouble.

Resin Segregation

MR. J. M. MIDDLETON (British Steel Castings Research Association), referring to the segregation of resin from powdered resin mix, asked whether the Author had any actual figures showing to what extent that could occur. His Association had carried out a few tests on shells made by dumping and had found a shell containing as high as 9 per cent. resin and in other places as low as 5¼ per cent. He also presumed from the Paper that pre-coated sands could carry a lower resin-content than could the powder mix, and also have higher permeabilities: had the Author any experience of the behaviour of the pre-coated sands—did they give a better finish and prevent the formation of that very serious defect that one got with steel castings when using the shell-moulding process? Also, had the Author any suggestions as to how that defect could be overcome?

With regard to Fig. 24 in the preprint, he also had found slower rates of heat extraction from unbacked moulds than from backed, presumably due to the lower heat capacity. Was it possible to take advantage of backing say, by compacting metal in the mould, thereby acting as a chill?

MR. BAILEY, in reply, said it was possible to get segregation in the dump-bucket but he had never encountered it to any serious extent using normal types of sands containing fines, like the Redhill or King's Lynn, but if one had some sand in the dump-bucket which was fairly coarse, segregation did tend to increase fairly rapidly. However, with the finer sand, providing the wetting agent was added and the thing was given a thorough mixing, resin segregation would not be encountered to any harmful extent. Occasionally it was possible to

see small resin-rich patches on the surface; at the end of the investment the patternplate was taken away and there was a certain amount of resin dust, and that fell down on the surface of the sand.

With regard to the coated sand giving a better finish, he had no evidence as yet that it really did and he did not see why it should, and as for overcoming the defects at present being encountered on plain carbon steels, he wished someone could give him some information on that subject.

In reply to Mr. Middleton's question on backing, Mr. Bailey showed a slide (Fig. D) from American work which shed a lot of useful light on the problem of the heat extraction of shell. The work was carried out on gunmetal plates 1-in. thick. It was possible to see that as the thickness of the shell mould got closer to the thickness of the sand mould, so the heat-extraction rate increased, but also when one came down to $\frac{1}{8}$-in. shell which was shot-backed it should be possible, on production, for special purpose jobs to utilize some of the better cooling properties. If those were combined and a metal former was taken (something like a permanent mould) and then one blew sand face on to that, the heat-extraction rate could be controlled according to the thickness of the sand over the face of the permanent mould.

Removing Traces of Solvent

MR. D. CHALDER said the Author had mentioned the difficulty of removing traces of solvent in the coating process, and there had been a question on the variability of coated sands. He would be glad if Mr. Bailey would comment on the variability possibly being due to the residual traces of solvent which were left behind.

With regard to the use of a contour plate at the back of the mould, which was an excellent idea and had been mentioned at the previous IBF Conference, if he remembered rightly one of the difficulties was the position of flow orifices, bearing in mind the fact that the sand had to travel laterally, and the size of mould was actually limited by that fact.

MR. BAILEY, replying to the question of getting rid of the last traces of solvent, said if there was a solvent present to such an extent that it was really going to upset the working properties of the coated sand, the material would not be able to be worked due to clumping. The best way he knew of getting rid of the last traces of solvent was to pass it pneumatically through a pipe, when the air seemed to take out the solvent.

The method shown in Fig. 12 of the preprint was not the "D" process which, as he understood it, used a wet mix. The shell was actually punched through the contour plate, which was riddled with holes closer than a colander. There was a skeleton framework to give the contour, the air came on with an impulse technique and punched the stuff straight through. At the moment it was found that an ordinary standard shell-mould mix with about 5 per cent. of powdered resin was sufficient to do the job.

Gating and Feeding

MR. J. FALLOWS (Polygram Casting Company, Limited), referring to the Author's comments with regard to the general practice on gating and feeding, said although accurate, the statement that the principles were unchanged when talking about gating and feeding practice in relation to the two processes was a little misleading. The principles obviously would remain unchanged but the practice had to vary considerably and it could not necessarily be taken that a casting which was gated and fed in a given manner in the sand foundry would necessarily produce as good a casting—or even a good casting—if the same practice was converted immediately into shell. With regard to resin-coated sands, it certainly had been his experience that there had been quite a lot of variation from batch to batch of the resin-coated sands which had been used to date in this country, which might be due to the frequent practice of using the hot coating process. It was very difficult to hold the temperature range required on that extremely good insulating material, sand, and possibly variations in sand temperature might be responsible for some of the wavering results from batch to batch, and if that were the case, possibly the cold process would prove to be more consistent.

Referring to the question of costs, Mr. Fallows said he had been trying to find out for the last eight years what were the costs in the sand-foundry industry, and he now knew just about as much as he did when he started. When one tried to sort out the main factors, it was extremely difficult to persuade the particular business to give one the necessary information. That, of course, was not to be wondered at, but he wished to put one or two pointers with reference to costs. In the sand-foundry industry, if one wanted to build a mechanized foundry to make, say, 200 tons of castings per week, how many hundred thousand pounds did one require for capital plant and equipment? For the equivalent production in shell, what would be the capital equipment required, and what difference in space would be required? Also, how much could be saved in outside transport by the great reduction of material coming into the shell foundry as opposed to the green-sand foundry? Finally, he wondered what the costs of the present green-sand foundries would be if they were operated on the same scale as the present shell-moulding foundries, and particularly if they had the scant attention which so many of the shell-moulding foundries were receiving from the technical aspect? One too often saw a harassed, over-worked foundry manager who was responsible for 210 tons of castings a week; obviously he looked after his 200 tons of sand castings first, and after that his 10 tons of shell castings only if he had sufficient time, and all too frequently he had too little time.

MR. BAILEY, in reply, said he was in agreement with Mr. Fallows on the runner system, as his remarks emphasized the points outlined in the Paper.

With regard to the sand-temperature variation for coating, if one started off with a cold mill, one

might get some temperature variations, but if the temperature was down on the first batch, one could run two or three lots of sand through the mill just to warm it up. It was quite easy to tell whether one had been successful from the point of view of the temperature, because if it was not hot enough there would be a lot of resin-rich "chip" in the mix; if the temperature was too high the resin might be damaged, but that was not very likely to happen. The question of costing was an extremely difficult one to deal with. His own approach to the subject was that if he ever wanted any figures he got professional advice from the cost accountant.

Inconsistency of Pre-coated Sands

MR. M. M. HALLETT (Chamberlain & Hill, Limited) said he wished to make one comment of a very practical nature on the question of pre-coated sands. The Author had said that the advent of pre-coated sands constituted a major advance, but if it was possible to have pre-coated sand of a consistent quality, the advance would be very considerable and he, Mr. Hallett, would be a much happier man. There were, as far as he knew, three sources of pre-coated sand available in this country, all of which he had tried and all of which were inconsistent. There was no question that they were so inconsistent that they could not be used; they were, in fact, being used in large quantities but the lack of consistency was a serious headache to the harassed foundry managers about whom Mr. Fallows had just been speaking. As a result of that inconsistency—which, of course, was bound to be cured in time—a good many foundries would like to do their own pre-coating, and were in fact conducting experiments along those lines. To his own knowledge, one foundry was entirely operating on its own pre-coated sand. To the average foundry, the cold-sand process sounded at first much more attractive because of the unsoundness of handling hot sand, and it was therefore disappointing to hear from Mr. Bailey that in his view, the hot process was so much better than the cold. He would welcome Mr. Bailey's comments on how soon he thought it would be possible to arrive at the happy state of getting regular supplies of pre-coated sands of consistent quality.

MR. BAILEY, in reply, pointed out that he had said in his Paper "the advent of consistent quality coated sand." There had been some doubt at first whether coated sand would ever be any good, because in the very early development stages, people had wondered whether it would be possible to break the material down from a rock-hard condition, and there had been a lot of "doubting Thomases." It might be thought that in this country the process had been taken out of the laboratory and put into the production stage too early, but he believed there was considerable justification for having done that. The people concerned would not be so far advanced now if they had not taken that plunge. He was surprised to hear Mr. Hallett say that he could not get coated sand of consistent quality by coating it himself, and his own view was that if one did as one was told by the resin manufacturer it would be all right.

MR. HALLETT said in that case why could not the coated-sand manufacturer do this, he was in a much better position to undertake the job?

MR. BAILEY replied that the coated-sand manufacturers would have to "paddle their own canoe" on that one, but on the whole he thought they were doing a good job.

MR. RICE asked whether, when the cold process was used, there was any health or safety hazard at all in the use of the solvent.

MR. BAILEY replied that one thing he did not like about the cold process was that the solvent was alcohol and being a teetotaller it gave him a headache! Another point was that with some solvents, there might be an explosion hazard, although he knew of one man who, in order to get rid of the smell of alcohol, ignited the excess alcohol.

MR. J. BUTLER asked about the health hazard, as opposed to the purely safety hazard.

MR. BAILEY, in reply, said in some cases one might get some fumes of phenol, *i.e.*, carbolic acid, well known as a disinfectant. He doubted whether it would be possible to get the phenol in sufficient concentration that it would do people harm.

The CHAIRMAN proposed a hearty vote of thanks to Mr. Bailey for his very much appreciated Paper and the excellence of the discussion it had aroused.

The vote of thanks was accorded by acclamation, and the Author responded briefly.

WRITTEN CONTRIBUTIONS

Shell Assembly

MR. D. H. SCOTT, of E. Green & Son, Limited, wrote that his firm were using the shell process extensively and initially had experienced much trouble in keeping the assembly operation in step with mould production. Assembly of hot shells straight from the pattern appeared to be the best production proposition, and was successful with liquid adhesives applied first by hand guns and later by a printing device. The closing processes are pneumatically operated, the pressure points being attached to the plates by rubber bungs. Liquid adhesives are messy and inconvenient, owing to the short "shelf" life once the adhesive has been mixed with its hardener. The firm tried the American method mentioned on page 11 of the preprint of the Paper, where powdered phenolic resin is applied to a hot shell by means of a drilled tray. From studies of American literature, this seemed to be the most popular method used there on a production basis, but when tried at Green's, under the conditions prevailing, the following disadvantages were found: (1) Bonding was erratic and frequently the glue-line thickness was excessive; (2) the quantity of resin falling down from each hole in the tray was not uniform, and was difficult to control; (3) when the mating shells were put on, powdered resin from the top of the larger mounds was pushed into the mould cavity and created blowholes in the casting; and (4) in the presence of

a draught, the powdered resin being very light, would not fall where required.

Many of the firm's castings were such that the shells only required sticking around the outside edges, and for these the disadvantages listed were overcome by modifications to the resin tray. This tray (Fig. E) consists of a rectangular mild-steel frame, of inside dimensions the same as the outside dimensions of the shell—except for a narrow margin, ½-in. wide around the outer sides of the mild-steel frame; this is blocked out. The ½-in. area is made up by using a series of the ordinary skimmer-gates which are used in general foundry practice. On the ends of the frame are welded two lugs drilled with ¾-in. dia. holes. Two pins are then fixed to a baseplate at the same centres as the holes drilled in the steel frame. Springs are put over the pins, the mild-steel frame is fitted, and the box is then filled with phenolic resin. The procedure in glueing is then as follows: The shells come straight from the machine; the bottom half is put into the press and cored up; the top of the shell is placed upsidedown under the mild-steel frame, and the tray is then banged down once on to the shell. Due to the edges of the frame being perforated, the necessary amount of resin can

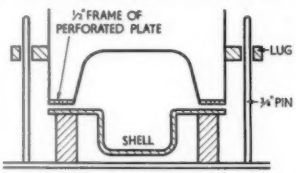


FIG. E.—*Modified tray for applying fixing adhesive to shell halves prior to assembly.*

always be deposited on the shell, and also always in the correct position. This shell is then placed on the bottom shell, and pressure is applied to both. The time taken with this method is 10 sec., speed being essential, as slowness results in small particles of resin setting hard, thereby holding the two shells apart. This method, however, is not suitable for shells having small joint areas between the mould cavities and shell edges.

Replying to Mr. Scott, MR. BAILEY wrote that he was particularly indebted to Mr. Scott for reporting his findings. The direct use of a solid adhesive had obvious attractions and initial experiments were carried out in the author's experimental foundry, where small neat mounds of powdered resin were placed by hand on to the hot shells and subsequently closed with a hot mating half. On sectioning the shells, it was clear that there was no glue-line thickness to keep them apart and cause flash, as all the resin had penetrated into the shells. This at first appeared ideal for hot/hot assembly, as liquid urea adhesives were not entirely satisfactory because they cured so rapidly that a glue-line 0·005 to 0·008-in. thick was common. However, on scaling up to production conditions, using the drilled tray to deposit the resin, all the disadvantages listed by Mr. Scott were found to occur. The most serious, that of erratic bonding and thick glue-lines, was due to small particles of resin falling outside the main mound; these being small instantly heated up and cured. On applying the mating shell, these pre-cured blobs, being hard, then held the joint faces apart, and the main resin mound on melting soaked away into the two separate halves or alternatively caused a thick glue-line.

Pelleted Glue

This disadvantage was overcome by using the phenolic resin in pellet form and not as a free powder. The pellets were applied to as many spots as desired in one simple operation by the sleeve applicators, shown in Fig. F. When a hot shell was pressed face downwards on to the applicators, the pellets instantly adhered. Pellets used in this manner also overcame the other three disadvantages

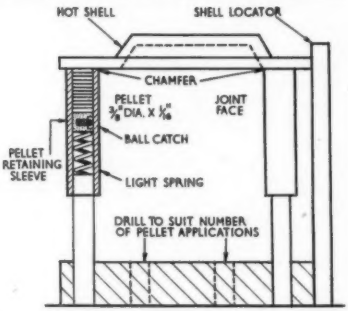


FIG. F.—*Method of applying pellets of phenolic resin to hot shell halves for glueing purposes.*

of free powder listed by Mr. Scott. This development was not limited to the shell field, it could, for instance, be used for assembling conventional cores immediately after stoving.

Particle Size

MR. L. A. PHELPS wrote that he congratulated the Author on a very interesting and enlightening article, but would like to raise the following points: In powder metallurgy, one of the methods employed in particle-size determination was to pass air (or any other suitable gas), through a sample of the metal powder. By Einstein and Oseen's modification of Stokes's Law, it could be shown that particles of the same specific gravity separated out according to their size. Whilst this was strictly not the case in core and mould blowing, it would appear that blowing downwards would tend to result in the larger particles separating out on the bottom face of the core, shown in Fig. 7, or the pattern shown in Fig. 12. Blowing upwards would tend to result in fine particles being at the core faces, shown in Figs. 8 and 9. In Fig. 10, there might possibly be a grading of particles from the bottom to the top of the hot former. It would be interesting to know, first, if the Author had any experience of this, and if so, if there was any difference in surface finish of castings in moulds

Shell-moulding Practice—Discussion

prepared by blowing upwards compared with those from moulds prepared by blowing downwards? Second, was there any tendency for build-up to occur at the top of the hot former, shown in Fig. 10, if so, how was it overcome?

In reply, MR. BAILEY wrote that he considered that the conditions encountered with practical core-blowing were such that the laws referred to could not apply and the grading of sand particles according to size within the core, was not influenced to any significant degree by the principles outlined by Mr. Phelps. Provided the degree of packing was equal there should be no difference of casting finish whether the core was produced by blowing upwards or downwards.

An important feature of these principles was that the air was used as a pushing medium and not a carrier; the duration of a blowing cycle was very short so the sand grains had little or no opportunity of sorting themselves out according to size. However, it had been found that a small amount of air entered into the sand charge by reason of its permeability and this was beneficial as it appeared partially to render fluid or "lubricate" the charge. This was concluded as the result of an experiment where the air was prevented from entering into the charge by means of a rubber diaphragm across the sand chamber.

Early work with the blowing of powdered sand/resin mixes with the "open system" principle (Fig. 3) provided a useful pointer on this separation question. Powdered resin was very much lighter and finer than sand grains and in cases where resin segregation appeared on the cores it was found that this occurred as a result of ricochet action within the corebox and not as, or before, the mixture left the blower. The ricochet of the sand stream within the corebox should have far greater significance than the principles of blowing described, in causing grain grading, and theoretically one might expect this to be troublesome when blowing coated sands; yet in normal practice this was not so, but it might happen with large cores if the sand contained a substantial proportion of both fine and coarse grades. Coated sand behaved like dry silica sand when blown into a corebox and the ricochet action of dry sand had been most clearly shown in the film "Sandstorm Secrets" which had been shown to many branches of the Institute.

Regarding Mr. Phelps second question, there was no tendency for build-up of material from the sand stream to occur at the top of the hot former. During the blowing period, the sand would be moving over this region at such a fast rate that it would be unable to pick up the heat necessary to cause melting of the resin. Also, the incoming sand stream would have a blasting action in that area which would remove any adhering material.

New Plant for Aluminium Corporation

To meet increasing competition, the Aluminium Corporation, Limited, is to instal a new £500,000 rolling-mill plant at Dolgarrog, Conway. The plant which weighs over 600 tons should be in production by 1959. It will be used in the first stage of rolling hot billets of aluminium before they pass to the thinning-out machine.

Present output of about 6,000 tons a year will be substantially increased when the new rolling mill comes into operation and it is anticipated that increased production will mean more employment. The number of employees at the Aluminium Corporation (a subsidiary of the British Aluminium group), has already increased from under 500 in 1948 to over 700. Much of the aluminium processed at Dolgarrog is used in atomic energy plants, the aircraft industry, and for motor vehicles.

Industrial Production Lower

The industrial production index (1948=100) for September has been provisionally estimated at 139-140, compared with 140 for September, 1955. The figure for August is now estimated at 115 (118); and that for July has been amended to 128 from the provisional 126 (112). The September index of mined coal is down, compared with last year, by 2 points, cars are down by 23 points, and motor lorries are 24 points lower. Steel is up by 5 points, and electricity generation by 11 points.

The index for the first nine months of this year has averaged 135, compared with 134 in the comparable period of 1955; since the middle of last year the figure has fluctuated very little.

Census of Production Returns

An Order prescribing the matters about which returns may be required for the 1956 census of production has been made by the Board of Trade. Undertakings producing coal, gas, electricity, oil shale, crude or refined petroleum, or shale oil products are exempted from making census of production returns to the extent to which they supply the necessary information to the Minister of Fuel and Power (or in certain cases to the Secretary of State for Scotland). Companies affected by the census have already been notified.

As already announced, the census of production to be taken next year for 1956 will be a simplified census on a sample basis, similar to last year's census.

The new Order is the Census of Production (1957) (Returns and Exempted Persons) Order, 1956, SI No. 1648 (Stationery Office, price 3d., by post 5d.).

Engineers Make Cheap Car

At 10s. under £400, the new Unicar is among the cheapest four-wheeled saloon cars on the British market. It is the product of S. E. Opperman, Limited, of Borehamwood (Herts), a firm not hitherto associated with motor-car manufacture. A maximum speed of 60 m.p.h. with a petrol consumption of 55 m.p.g. is claimed for the Unicar. In construction, a combination of resin-bonded glass fibre reinforced by steel has been used and motive power is a British Anzani twin-cylinder air-cooled, two-stroke engine.

S. E. Opperman is a long-established company which operates three factories. Production includes gears of all types and sizes, marine and aircraft radar units, machine tools and components for the motor and aircraft industries.

Automation at Leyland Motors, Limited

Further stage in the Mechanization Project Completed

To increase the output of cylinder blocks, further mechanization has been introduced in the Farington iron and steel foundry of Leyland Motors, Limited. The production line affected is that producing many hundreds of cylinder blocks weekly for British and foreign engine manufacturers, such as Jaguar, Albion, International Harvester, and Valmet in Finland. It is entirely separate from the plant engaged in supplying the increasing number of castings used to maintain the expanding output of the firm's own diesel engines. The problem of introducing production-boosting automation, whilst maintaining continuous day-to-day production, is being met at the foundry by a gradual planned process of which the new plant is the latest stage.

Modernization within the existing framework of production has, in recent years, embraced the sand-reclamation and mixing plant and the filling and ramming of moulding boxes. Three years ago,* the handling plant in the pig-iron stockyard was re-equipped and mechanized to ensure greater quality of control and to speed the charging of new cupola furnaces. Even more recently, an automatically-operated, airless, shotblasting plant† was introduced to mechanize the cleaning of iron and steel castings. New buildings, covering an area of over 25,000 sq ft., have also been erected to house extensions to the sand-drying shop, coreshop and knock-out bay.

Green-sand Moulding

The latest step in this process of automation has been the complete re-organization and re-equipment of the green-sand moulding plant at a cost of over £30,000. The new installation includes automatic machines and power-driven conveyors and roller conveyors extending nearly 500 ft. in length (see Fig. 1). Direct benefits accruing from this new plant will be a 100 per cent. increase in green-sand castings, and improved working conditions for the foundrymen, as mould fumes (previously released within the foundry) will be collected and dispersed by an overhead-canopy extractor unit.

The new line commences with an automatic moulding machine which produces the bottom half of the mould, a similar machine a little further along the line producing the top half. Each machine is controlled by an electrical timer which regulates the intervals between operations, once the machine has been set in motion. Before the operator presses the starter button, the moulding box is placed on the table of the machine on which the pattern is mounted. Sand is then fed from an overhead hopper, the doors of which are operated by a foot valve, and the machine is ready to carry out automatically the jolting, squeezing and stripping operations of mould making (Fig. 2).

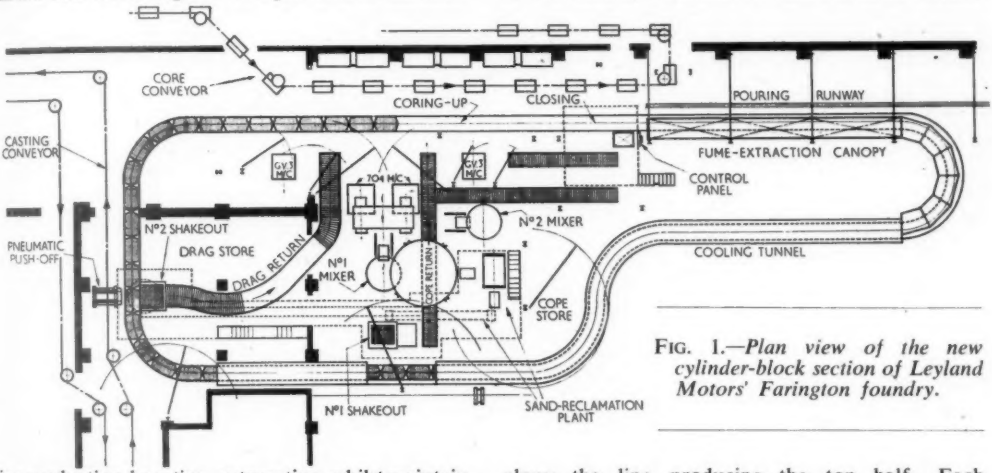


FIG. 1.—*Plan view of the new cylinder-block section of Leyland Motors' Farington foundry.*

Immediately the starter button is pressed, an arm carrying the squeeze-head swings in over the table and the machine jolts for a pre-set time to compact the sand. The table then rises against the squeeze head to push the sand into the moulding box, jolting at the same time to achieve maximum mould consistency. When this operation is completed, the table sinks to its original level, the squeeze head swings out, and four pins engage the underside of the moulding box to strip the mould clear of the pattern.

The moulding box is then placed on the power-driven conveyor which, at this point, is joined by a pendulum-type conveyor carrying cores, with which final assembly of the mould is completed.

See JOURNAL * February 25, 1954, † February 16, 1956, also "IBF Conference Works Visits," June 11, 1953.

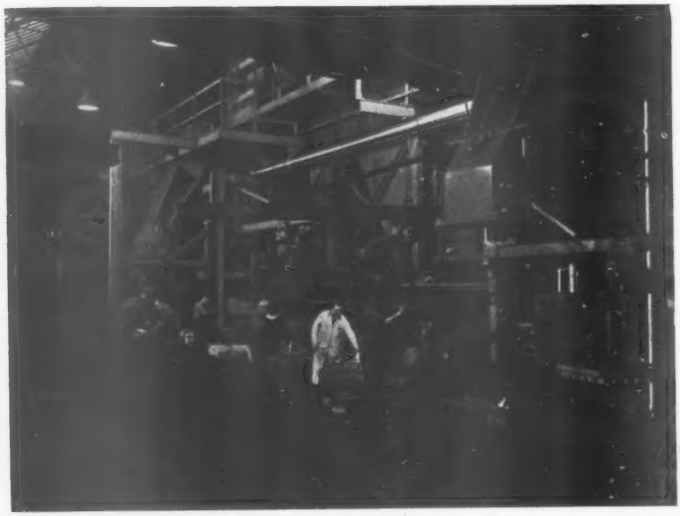


FIG. 2.—*Starting point of the newly-mechanized section foundry; the pendulum-type conveyor carrying cores is on the left and on the extreme right is the automatic moulding machine which produces the bottom part of the mould, with the foot-pedal operated sand-hopper overhead.*

off during the cooling period and discharges them into the outside atmosphere. When the cast moulds emerge from the tunnel, the moulding-box top is lifted off. A shake-out machine then removes the sand, which is returned to an underground pit for reclamation, and the box travels down a roller conveyor to the point at which it started its journey.

The bottom of the moulding box, carrying the casting, travels on a little further to a point at which the casting is transferred to another conveyor for transit to the dressing shop. The box is then removed from the line by a pneumatic pusher on to a shake-out machine for sand reclamation. From here, it returns to its original starting point by roller conveyor.

FIG. 3 (RIGHT).—*The pouring station, showing the fume canopy over the conveyor. (Farington foundry, Leyland Motors, Limited.)*

The mould conveyor is driven by an electric motor coupled to a caterpillar drive through a gearbox, the speed being infinitely variable and controllable at any rate up to the maximum of 5-ft. per min. To avoid "snatch," the driving dogs which engage with the continuous chain on the conveyor, fall back and disengage at the end of each cycle.

Pouring Station

The finished moulds are next conveyed to the pouring station (Fig. 3) where an electrically-operated monorail has been installed to carry the ladle in which molten metal is transferred from the cupola. It is at this point that the need for fume extraction begins, and a 60-ft. long fume-canopy, which leaves the working space unobstructed, withdraws casting fumes by fan suction. On leaving the pouring station, the castings enter a fume tunnel which contains any fumes given

Sir PETER ROBERTS, M.P., the Master Cutler and chairman of the Wellman Smith Owen Corporation, recently visited the Falls Foundry in Belfast and referred to a £½ million contract received from the Indian Government for steelworks plant, which, he said, would increase employment at this works.

SHELL CHEMICAL COMPANY, LIMITED, have appointed Foundry Services, Limited, Long Acre, Nechells, Birmingham, as their sole and exclusive distributor of Shell I.P.S.1 and I.P.S.2 isopropyl alcohol to the foundry industry in the United Kingdom and Republic of Ireland, as from November 1.

Book Reviews

Défauts des Pièces de Fonderie (Defects in Castings) Volume 1. Defects Due to the Solidification Mechanism. By H. Le Breton (in French). Published by Editions Eyrolles, 61, Boulevard Saint German, Paris Ve; price 2,900 francs, plus postage.

All foundrymen who have a fair residue of schoolboy French should possess one French text-book and they might do much worse than choose the volume under review. Not only will it improve their knowledge of the French language but it will introduce them to the French method of tackling problems. The typical Anglo-Saxon, when dealing with trouble in the foundry, tends to leap to an intuitive solution but the French technologist analyses the problem with the greatest logic and care.

This book deals with many of the normal foundry defects but it is in no sense an atlas of defects along the lines of that issued by the Institute of British Foundrymen. It is an extremely careful and detailed analysis of the reasons for the appearance of various defects, of the factors which influence their incidence and magnitude and of the principles by which they can be avoided. The treatment is logical and rigorous throughout. The author, indeed, will admit of no compromises. For example, in considering the question of distortion in castings he regards the incorporation of camber on the pattern as positively dishonest and insists that the problem must be attacked at its source so as to remove the causes of the distortion. He realises that such an approach, with its methodical and detailed consideration of all the factors, may be expensive but claims that all such expense can be avoided by proper initial co-operation between the designer and the foundryman.

The French method of logical and exact classification of all possible cases sometimes leads to some combinations of phenomena being overlooked or omitted. For example, in considering the solidification of castings, the book clearly differentiates those cases in which solidification proceeds by the steady growth of a solid wall from the mould surface and those cases in which, between the solid wall and the liquid interior, there exists a pasty region. It does not appear to consider the case in which the pasty region for much of the time extends throughout the whole casting, an occurrence which is normal in many types of grey cast-iron.

Nevertheless, the British foundryman, when his intuitive guesses have failed to work, will often find it helpful to read the critical French analysis of the factors influencing his particular trouble and from this consideration to evolve further lines of attack on the problem. The author, in spite of his logic, is clearly well acquainted with actual foundry conditions. He emphasizes that it is essential to see that instructions given to all members of staff should be both understood correctly and carried out exactly. He also recognizes the undesirability of depending on the human element.

The volume is divided into two main parts. The first part deals with those defects due to the various stages of contraction during solidification and cooling, covering such troubles as shrinkage cavities, hot-tears, hot cracks, formation of internal stresses, distortion and cold cracks. The second part deals with defects due to the actual crystallization process including the various types of segregation, lack of feeding and the various defects due to failure completely to fill the mould. In the course of both these sections, much good advice is given and little fault can be found with the author's analysis of the sequence of events. Even for those whose knowledge of French is very limited, a study of the drawings will frequently show clearly what is in the author's mind and a study of the tables giving the rules for designing the junctions of the various sections will be found to be most helpful. The author's whole argument is designed to show how much good results from proper co-operation between the engineer and the foundryman and all foundrymen will testify to the value of this objective.

An Encyclopaedia of the Iron and Steel Industry. Compiled by A. K. Osborne, A.Met. Published by the Technical Press, 1, Justice Walk, Chelsea, London, S.W.3; price 90s. net.

This book would serve a very useful purpose if placed in the hands of translators of technical articles as it would tend to eliminate the many mistakes due to ignorance of the significance of the words used; most dictionaries give a choice of synonyms and it is not unusual for translators to use the wrong one. So far as the foundry industry is concerned, the book has responded excellently to the check made of the interpretation of specialized terms. The reviewer was a little disturbed, however, when turning up a number of bibliographic references to find matters first disclosed in the FOUNDRY TRADE JOURNAL were "credited" to subsequent publications. Typical of these are the entries for the Croning or shell-moulding process, the Croft Process, the CO_2 Process, and the Autoclino machine. The appendices are generally excellent and it is suitable that they should be included in such a book. Whether the addresses of the various institutions and trade organizations should be given in a work of such a "permanent" nature is open to question, as many are liable to change; this has already happened in the case of the Zinc Development Association and the Light Metal Founders' Association. One final criticism is that, in a book of such a high standing, the five diagrams appearing in appendix III should have been of uniform quality, as that dealing with the effect of tempering plain carbon steel is extremely difficult to decipher. Despite these minor criticisms, the reviewer retains a very high opinion of the real merit and unquestioned usefulness of this book in solving the meaning of a very large number of technical expressions used in the foundry and allied industries. It is a large tome running to over 550 pages and carries a number of quite pleasing illustrations.

Publications Received

Where Industry and Agriculture Meet. Published by Guy Motors, Limited, Wolverhampton.

Some years ago, this firm took an unusual step for an industrial concern, by issuing a brochure which was virtually a guide-book to local beauty-spots. This brochure set out to dispel the general impression that Wolverhampton, associated in the public mind with the Black Country, is "the sort of place to be avoided." This impression, the company felt, discouraged their friends and customers from visiting them, so they took pains to detail the charms of the Shropshire and Staffordshire countryside which lies within easy reach of Wolverhampton. Somewhat to their surprise, the book was very popular, and the demand for it remained so steady, that a new and enlarged edition has been published carrying more and better pictures in colour and monochrome, and even more enticing details of the rural beauty spots in their neighbourhood. They have also added a few interesting items of general information—the sovereigns of England, types of architecture, hallmarks on silver—that give the brochure added value as a reference book.

Equipment & Supplies

Vibratory Unit

A new range of all purpose vibratory units is now available from the Blending Machine Company, Limited, of Bond Street, Hockley, Birmingham, 19, which should prove of considerable interest to founders. The units are of the self-contained rotary out-of-balance type, and are continuously rated and totally enclosed. They are impervious to moisture, dust, etc.; wound to suit any specified a.c. supply, and are being made in a wide size range of 40, 60, 80, 160, 250, 500, and 800 watts, to cover almost any conceivable use. Typical applications to which the units have been put include attachment to screens, hoppers, compacting tables, tamping boards, foundry knock-out grids, etc., where it is necessary to have a very strong, smooth vibrational resonance for effective operation. The vibrators can be supplied with side mounting lugs as shown in Fig. 1, or alternatively, with quick-release base mountings, depending upon the application.

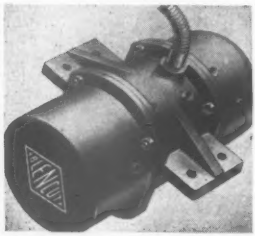


FIG. 1. — *Side-mounting electric vibrator, incorporating a rotary, out of balance motion, made by the Blending Machine Company, Limited.*

Digital Computer

An agreement for the joint purchase and installation of a Ferranti "Pegasus" digital computer has been reached by the University of Sheffield and the United Steel Companies, Limited. The computer, costing £50,000, has already been ordered from Ferranti, Limited, and will be delivered in March, 1958, being ultimately installed in a new mathematics block at the University. Both United Steels and the University will use the machine for their research programmes.

The "Pegasus" computer, which is the newest machine of its type, is constructed on the "package" system, each "package" consists of a small plug-in unit of standardized form, simplifying replacement and maintenance. Numerical data are fed into the machine on punched paper tape and the output is presented in a similar way, although the computer is capable of being adapted for information presented on punched cards or magnetic tape. It can be entirely controlled by one skilled operator.

Cutting-off Machine

The Osmond abrasive-wheel cutting-off machine, type "W" 7½ h.p., has been specially developed by the Mortimer Engineering Company, 210, Acton Lane, Harlesden, London, N.W.10, for use on medium-size work in the non-ferrous foundry. The machine is fitted with twin cast-iron tables which move independently, are counterbalanced, and can be locked in any desired position by handwheels in front of the machine; to facilitate the attachment of special fixtures, bolt slots are provided. For gripping small castings a large vice mounted upon a swivel base is also supplied. The motor is controlled by an automatic Star Delta starter operated from the front of the machine by a push button. The rocking frame, fabricated from mild steel, carries a 7½ h.p. totally enclosed continuously rated motor, and this can be locked to enable work to be fed into the wheel if desired. A dust hood is provided with a 4-in. dia. outlet for attachment to a dust-exhaust plant if required. It is claimed that the machine is capable of cutting 2½-in. dia. bronze in approximately 10 secs.

Spray Equipment and Spares

An addition to the service offered to users of spray equipment made by the Aerograph Company, Limited (47, Holborn Viaduct, London, E.C.1) is a kit of essential wear parts intended for the quick maintenance of the type JGA spray gun. This service kit is contained in a neat cardboard box.

Barrier Cream

Lloyd Hamol, Limited, of 11, Waterloo Place, London, S.W.1, at a Press conference held recently at the Savoy Hotel, demonstrated the efficiency of "Syl," a silicone barrier preparation, as a dermatitis preventative.

New Catalogues

Foundry Plant. Foundry Mechanisations (Baillot), Limited, Denbigh Road, Bletchley, Bucks, who are the sole concessionnaires for Alfred Baillot et Cie of Saint Ouen, France, for Great Britain and the British Commonwealth, have issued a 22-page well-illustrated catalogue covering sand preparation, handling, and continuous casting plants. Four types of sand mills are first described, followed by two methods of mill loading —one by conveyor belt and the other by skip loading, the hoppers of both being fitted with sieves. Descriptions of hexagonal sand sifters, disintegrators, feeder belts, rotary-plate distributors, moulding-machine hoppers and mould conveyors, make up the balance of the contents. This catalogue is available to readers on writing to Bletchley.

Mobile Storage Bins. Tansley Brothers, Limited, of Mill Lane, Kidderminster, Worcestershire, have prepared a leaflet which illustrates and describes a line of metal containers with wire-mesh panels mounted on a pair of legs and one wheel. On the body portion, between the legs, there is a pin which can be engaged with a simple two-wheel-lift bogie, to convert the whole into an articulated truck easy to manoeuvre. Those interested may obtain the leaflet by writing to the works at Kidderminster.

Metallographic Materials. A useful leaflet which has been received from Shandon Scientific Company, Limited, 6, Cromwell Place, London, S.W.7, is made more interesting by the inclusion of discs of the cloths they supply for metallographic polishing. The metallographist is indeed fortunate in the range of materials now available. Founders operating laboratories should write to Cromwell Place for a copy of this quite specialized leaflet.

Industrial Lighting. Holophane, Limited, Elverton Street, London, S.W.1, in catalogue number 5600 classify their lighting equipment under high bay, low bay and "Alicast fittings." It is a well illustrated 32-page brochure, and carries a wealth of technical and commercial data. Readers may avail themselves of copies by writing to Elverton Street.

Notes from the Branches

Coventry Section

The Coventry and district section of the Institute of British Foundrymen (attached to the Birmingham branch) held their opening meeting of the 1956/57 session at the Technical College, Coventry. Mr. T. H. Weaver, M.INST.B.E., A.M.I.PROD.E., president of the Birmingham branch, was present as guest of honour. Mr. Weaver, who has been a keen supporter of the section since its formation, made reference to the progress which it has made during the last few years. "If I may offer the section, and its members advice," he said, "the more friends you make in the Institute the better for discussions, understanding, and exchange of ideas that are beneficial to all. Sound friendship is a great asset to every member in the Institute of British Foundrymen." In turn, he paid tribute to and complimented the officials and members of the section, saying they possess the necessary technical and practical qualifications to accomplish anything that is called for in the way of modern methods, quality control, equipment, materials and castings. He mentioned, also, Mr. E. Player, senior, as a man who had brought great significance and a progressive outlook to the foundry industry of the Midlands and Coventry; he knew they possessed many other brilliant men, naming Mr. Reynolds, Mr. Bailey, Mr. Hancox, Mr. Fardoe, Mr. Wood, and Mr. Twigger among them. He stressed the importance of being an active member of the Institute and appealed to members of the section to try and extend membership within their city. The section president, Mr. D. R. Fardoe, then delivered his address taking "Communications in Industry" as his subject. He pointed out the need for establishing and maintaining a communications channel from the management, through superintendents, foremen and chargehands, to the workmen, in order that a free exchange of views and ideas might flow freely in each direction. The need for keeping the workmen fully informed on conditions affecting output and redundancy was also mentioned.

"Conditions in Foundries"

Following the presidential address, the speaker of the evening, Mr. W. B. Lawrie, M.B.E., M.SC., F.R.M.S., A.I.M. (H.M. Engineering Inspector of Factories), delivered a paper entitled: "Conditions in Foundries." Mr. Lawrie spoke of the need for preventing the formation of dust in the first instance, and its control in the second. His paper was illustrated with two films, which showed how dust produced in various dressing operations may be controlled. One of the films was shown for the first time. Mr. A. T. Holman, O.B.E., M.I.MECH.E., and Mr. J. L. Burgess, B.A., who, together with Mr. Lawrie were responsible for the research and development work which led to the film, were also present and assisted Mr. Lawrie in replying to the lively discussion that followed. The paper was very well received by the 50 members and visitors present.

South Africa

At the meeting on September 27 of the South African branch, Dr. L. B. Knoll was the lecturer, and his subject "What the Engineer Expects from a Casting." Members of the local branch of the Institution of Production Engineers were guests at the meeting, and the fact that the hall was filled to capacity, indicated the interest generated by the title.

In his introductory remarks, Dr. Knoll stated that every so often one heard that the foundry industry was archaic, that anything that was cast could be fabricated better and cheaper, that one knew what to expect inside a rolled or forged product but not what was inside a casting. Nevertheless, despite all the propaganda and competition, the foundry industry continued to progress from strength to strength, and cast components still formed an important part of most of the products of the metal manufacturing industry throughout the world. Dr. Knoll stipulated that the engineer required the utmost consistency of metal quality from a casting and that machinability was very closely related to metal quality and of considerable importance in the machine shop.

Speaking of dimensional control, he said that every dimension had a tolerance, and it was the consistency of castings within such agreed and specified tolerances that was most important to the manufacturing engineer. Of fettling and surface finish he said it was essential to the engineer, who processed large quantities of castings, that the cleaning and fettling of such castings be thorough and consistent. Even a small, thin flash left on a parting line could smash a carbide-tipped tool worth pounds, in machining one part worth shillings. Dr. Knoll admitted that delivery schedules were non-technical, but he made it clear that the importance of meeting delivery schedules could not be over-emphasized. He added that the planning of a mass-production operation, using tens of thousands of different components and materials to make perhaps a few score completed machines, was a very involved process, and in mapping out delivery schedules for castings it was essential that these dovetailed closely into the whole complicated jigsaw puzzle. The manufacturer had no alternative but to demand unfailing and accurate compliance with the delivery schedule he laid down. In conclusion, Dr. Knoll said that the closer the engineer could bring his design into conformance with the foundryman's requirements, the easier and cheaper it became for the foundryman to give the engineer everything he expected. The more the foundryman could do, therefore, to promote and enforce a close and continuous liaison between the design and production engineers and the foundryman, the easier it would be to achieve mutual success in the way of the best-quality final product at the least cost. A casting would be most successful when it was designed as a casting and not as a substitute for a forging or fabrication.

The resultant lively discussion was opened by the president of the Production Engineers, Mr. D. S. Clare, and the vote of thanks was proposed by Mr. Jack Tonge.

Tees-side

The Tees-side branch opened its 1956/57 session on Friday, October 12, an interesting innovation tried this year being that all lectures are to be given by members of the branch. The opening lecture was given by the immediate past-president, Mr. Frank Shepherd, J.P., who is also secretary, and for his subject he chose "Foremanship." There was an extremely good attendance and it was evident that considerable interest had been aroused.

At the end of the meeting, the president, Mr. A. P. Riley, drew attention to the next date on the branch programme—November 9, when the social evening was scheduled. At this function, the national president, Mr. H. J. V. Williams, and the national secretary, Mr. George Lambert, were expected to be present, and Mr. Riley expressed the hope that there would be an excellent attendance of members and friends.

Company News

JOHN I. THORNYCROFT & COMPANY, LIMITED—The final dividend is cut from 10 per cent. to 7½ per cent., making 12½ (15) per cent. for the year to July 31. Group trading profits decreased by £342,361 to £660,348 and the net profit is down from £531,992 to £344,751.

PEASE & PARTNERS, LIMITED—The directors announce that the reduction of the company's share premium account, having been confirmed by the court, has become effective and that the distribution of 3d. per share was made on November 6 to shareholders on the register on October 17.

QUALCAST, LIMITED—The company had a record turnover last year. Mr. Victor Jobson, the chairman, reported that the turnover was six times that of 10 years ago, but that profit was, at £800,567, the highest since the war.

MANGANESE BRONZE & BRASS COMPANY, LIMITED—Shareholders are informed that the acquisition of Steven & Struthers, Limited, Glasgow, has been completed. An offer to acquire the ordinary shares of Lightalloys, Limited, for 400,000 ordinary 5s. shares is still under consideration. It is stated that the estimated earnings of the company for the first nine months of 1956 show some improvement over the corresponding period of 1955.

STOTHERT & PITT, LIMITED, engineers and ironfounders, of Bath (Som)—The ordinary dividend is maintained at 17½ per cent. on capital increased by a seven-for-13 scrip issue. Group profits fell from £851,742 to £697,385. The parent company's profits rose from £781,304 to £796,285, but Australian interests suffered a considerable setback. Group fixed assets expanded from £975,740 to £1,126,020 and there are outstanding contracts for about £305,000.

LANCASHIRE DYNAMO HOLDINGS, LIMITED—The company proposes to acquire J. G. Statter & Company, Limited, switchgear manufacturers, of Amersham Common (Bucks), and for this purpose proposes to increase its capital to £3,000,000 by the creation of 500,000 ordinary shares of £1 each. The proposed acquisition will also include Minerva Mouldings, Limited, an associated company, which manufactures a range of moulded products for the electrical industry.

LE GRAND, SUTCLIFF & GELL, LIMITED, oilfield equipment manufacturers, founders, etc., of Southall (Middx)—Subject to CIC consent, the directors propose to issue for cash to Platt Bros. & Company (Holdings), Limited, textile and general engineers, the unissued ordinary capital of 400,000 5s. shares. Subsequently Platt Bros. will make an offer to all Le Grand shareholders of 8s. 6d. per share for 25 per cent. of ordinary share holdings. Certain large shareholders have indicated they will accept the offer.

OXLEY ENGINEERING COMPANY, LIMITED—The dividend is maintained at 17½ per cent., less tax, and the tax-free bonus of 2½ per cent. is also maintained for the year ended June 30 last. A one-for-two scrip issue is proposed, subject to Treasury consent. Previous capitalization of reserves was in 1951 with a one-for-four free share issue, which raised the capital to its present level of £250.000. After deducting £90.466 (£77.960) for tax, the group net profit of £94.401 goes against £89.877 previously, while the parent's net balance is £70,161 (£68,931) after tax of £60,216.

New Patents

(Copies of complete specifications are obtainable from the Patent Office, Sales Branch, 25, Southampton Buildings, Chancery Lane, London, W.C.2, price 3s.)

756,834. Vanadium Corporation of America, 420 Lexington Avenue, New York, 17, New York, USA.

Material for addition to cast iron or steel. It results in a nodular of spheroidal-graphite formation of the iron or steel with an increase of both strength and ductility of the metal.

756,860. Regie Nationale des Usines Renault, 8-10 Avenue Emile Zola, Billancourt, Seine, France, and Ste. des Hauts Fourneaux et Forges d'Allevard, 17 due de la Rochfoucauld, Paris, Seine, France.

A machine for casting ferrous metals under pressure. The wall of the pouring hole leading to the molten-metal magazine cylinder is lined with a refractory material having great mechanical strength. A scraper piston is adapted to slide in this hole in order to prevent the blocking of it by solidified metal, and to close the pouring hole flush with the wall of the magazine cylinder at the end of travel (*cf.* patent No. 756,918).

756,977. United Steel Companies, Limited, 17, Westbourne Road, Sheffield, 10.

Improvements in ferritic steels which are claimed to give them properties rendering them particularly useful for use in superheaters in steam plants. The composition of the steels is given as follows: Chromium 7 to 9, manganese not exceeding 2, silicon not exceeding 2, carbon not exceeding 0.15 per cent., molybdenum 2 to 8 (with or without tungsten or vanadium or both), the molybdenum content in the presence of tungsten and/or vanadium being at least 1.5 per cent., and titanium 0.9 to 4 (with or without niobium or tantalum or both), the titanium content being at least 0.9 per cent., and not exceeding 3.5 per cent. in the absence of niobium or tantalum, and the total niobium plus tantalum content being not greater than 1 per cent. The aluminium content should not exceed 1.0 per cent., the balance being iron.

757,326. Magnesium Elektron, Limited, Lumm's Lane, Clifton Junction, near Manchester, Lancs.

A method of producing magnesium-base alloys containing zinc 2 to 8, rare-earth metals 9.3 to 2, and manganese 0.1 to 2 per cent. A small quantity of iron is also introduced by means of a pre-alloy of iron with one or more of the zinc or rare-earth metals (see also No. 757,375, magnesium-base alloys for casting).

757,383. Rem-Cru Titanium Inc., Midland, Pennsylvania, USA.

Titanium-base alloys consisting of tin 2 to 23 per cent., the balance being titanium, apart from the usual impurities.

757,413. British Non-Ferrous Metals Research Association, 81-91, Euston Street, London, N.W.1.

New and improved titanium-base alloys and their use in industry, particularly for the manufacture of gas-turbine and similar engine components.

THE BRITISH TRANSPORT COMMISSION 222 Marylebone Road, London, N.W.1, have just issued a brochure detailing the next season's arrangements and cost of hiring accommodation in "camping coaches" for summer holidays. There is a choice of dozens of locations in all parts of the country.

Forthcoming Events

NOVEMBER 12-17

Public Works and Municipal Services Congress and Exhibition Olympia, London.

NOVEMBER 12-13

Birmingham and District Industrial Safety Training Centre

Industrial Truck Drivers' Course, and November 14-15, Maintenance Workers' Course. Details of both courses from W. G. Appleyard, 21, Steelhouse Lane, Birmingham, 4.

NOVEMBER 12

Institute of British Foundrymen

Sheffield and district branch:—"Things You Should Know," by Dr. J. G. Pearce, 7 p.m., at the Engineering Lecture Theatre, University Buildings.

British Occupational Hygiene Society

Conference on "Fires in Industry," 10.30 a.m., at the London School of Hygiene and Tropical Medicine, Keppel Street, London, W.C.1.

NOVEMBER 13

Institute of British Foundrymen

Coventry and district section:—"Founding Principles, their Application to all Metals," by G. J. Rogers, 7.30 p.m., at the Coventry Technical College, Room A5.

Slough section:—"Gases in Metals," by Dr. C. E. Ransley, 7.30 p.m., at the Lecture Theatre, High Duty Alloys, Limited.

Institution of Production Engineers

Birmingham graduate section:—"Patternmaking," 7 p.m., at the Corn Exchange, Kidderminster.

Halifax graduate section:—"Die-casting—Production of Certified Zinc-alloy Die-castings," by R. Parish, 7.30 p.m., at the Huddersfield Technical College.

Incorporated Plant Engineers

Manchester branch:—"Lubrication and Selection of Lubricants," by G. Scott, 7.15 p.m., at the Engineers' Club, Albert Square.

NOVEMBER 14 to 17

Sheffield and District Foundry Exhibition

Edmund Road Drill Hall, Sheffield, Wednesday to Friday (November 14 to 16), from 2 p.m. to 9 p.m., and Saturday, from 10.30 to 8 p.m.

NOVEMBER 14

National Society of Master Patternmakers

"Pressure-cast Aluminium Patterns," by D. H. Potts, 2.30 p.m., at the Birmingham Exchange and Engineering Centre, Stephenson Place.

Institution of Chemical Engineers

Midlands section:—"Handling of Sulphuric, Nitric, and Hydrochloric Acids," by Dr. H. Saenger, 6.30 p.m., at the Birmingham and Midlands Institute, Paradise Street.

Incorporated Plant Engineers

Western branch:—"Materials Handling," by J. G. Parkes, 7.15 p.m., at the Grand Hotel, Bristol.

NOVEMBER 15

Institution of Works Managers

Leicester branch:—"Education of the Production Engineer in Industrial Engineering," by Mr. France, 7.30 p.m., Loughborough College.

Incorporated Plant Engineers

Blackburn branch:—"Smoke Abatement," by J. D. Lewis, 7.30 p.m., at the Golden Lion Hotel.

NOVEMBER 16

Society of Industrial Radiology

London branch:—Joint meeting with the Society of X-ray Technologists, 7 p.m., at the British Institute of Radiology, 32, Welbeck Street, London, W.1.

Institution of Production Engineers

Dundee section:—"Production of the Voith Schneider Propeller with Particular Reference to its Manufacture," by A. Betts Brown, 7.30 p.m., at the Technical College Hall, Bell Street.

NOVEMBER 17

Institute of British Foundrymen

Bristol and West of England branch:—"Some Aspects of Modern Casting Design," by R. W. Ruddle, M.A., 3 p.m., at the Grand Hotel, Broad Street, Bristol.

East Midlands branch:—"Receivers, Tapping Systems and Slag Disposal"—Report of sub-committee T.S.44, presented for discussion by S. J. Sargood, 6 p.m., at the College of Technology and Commerce, Leicester.

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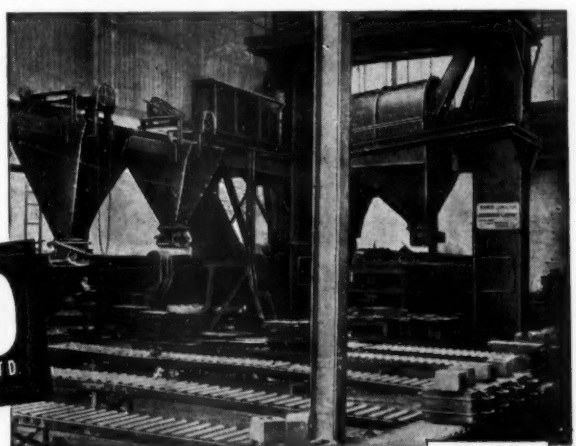

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FT4

Personal

Mr. F. A. BEAL has been appointed a director of John Fowler & Company (Leeds), Limited.

Mr. F. W. MCLEOD has been appointed a director of George Wimpey & Company, Limited.

Mr. T. W. D. COOPER, sales director of Qualcast, Limited, has been re-elected to the board of directors.

Mr. J. A. WYLDE, director and sales manager, has been appointed general manager of Hale & Hale (Tipton), Limited.

Captain F. S. BELL has taken up an executive position with Pollard Bearings, Limited, Ferrybridge, manufacturers of ball bearings.

Mr. G. E. GODFREY has resigned his position with the Dunlop Rubber Company, Limited, to join the board of the Silvertown Rubber Company, Limited.

Dr. JOHN B. MAVOR, former joint managing director of Mavor & Coulson, Limited, has been elected an honorary member of the Institution of Engineers and Shipbuilders in Scotland.

Dr. R. C. G. WILLIAMS, chief engineer of Philips Electrical, Limited, has been elected chairman of the Radio and Telecommunication section of the Institution of Electrical Engineers.

Taking part in golden-jubilee celebrations in South Africa to mark the completion of 50 years' successful trading with the Union by W. & T. Avery, Limited, are Sir PERCY MILLS, chairman of the company and Mr. AUSTIN MORLEY, managing director.

Mr. C. S. MALLATRATT, an artist with the Metal Box Company, Limited, Mansfield, who designed the decorations used on many tin boxes, has retired after 50 years with the company and recently received presentations from the company and staff.

Mr. T. MORRISON, cost accountant with Glenfield & Kennedy, Limited, Kilmarnock, has retired after 50 years' service with the firm. Presentations on behalf of the management and staff were made to him by Mr. D. S. Gardner, director of the company.

Employees of the Erdington, Birmingham, factory of Fisher and Ludlow Limited, on October 29, presented a portable television set to their chairman and managing director, Mr. ARTHUR KEATS, who retired on October 31 after having been with the company for more than 40 years. He had been managing director since 1920.

Mr. C. G. ROBERTS has been appointed to the board of Smiths Aircraft Instruments as director of research. Mr. Roberts, who is 44, joined Smiths two years ago and was put in charge of the company's guided weapons programme. In his new appointment he becomes responsible for all guided weapons and aviation research undertaken by the company.

A record pass figure in his Services trade test, even for the high standards required by the Royal Navy, has been obtained by Mr. RONALD HASTIE, a foundry apprentice with Clarke Chapman & Company, Limited, Gateshead, who last year attended the National Foundry Craft Training Centre. Mr. Hastie, who has been able to follow his craft whilst doing his National Service in the RN, passed the test with a marking of 98 per cent.

Mr. ALFRED BOWLT has been appointed chief buyer of the Guest Keen Iron & Steel Company, Limited, in succession to the late Mr. A. S. DAVIES, M.B.E. Mr. Bowlt was with the company from 1933 until 1940, when he was seconded to the Ministry of Supply as assistant to the Director of Pig-Iron Supplies. In 1946 he joined the staff of BISC (Ore), Limited, on its formation, and the following year was appointed pig-iron officer with the British Iron & Steel Federation and secretary of the pig-iron liaison committee. In 1953 he was appointed raw materials officer.

The retirement after 41 years' service of Mr. A. PERRY, consultant on production to Ransomes & Rapier, Limited, Ipswich, was marked by the presentation of a wrist watch and electric clock, made by the works director, Mr. N. F. Dare. Mr. Perry joined the company in 1915 as machine shop foreman and was closely concerned with the "Stokes" gun (designed by Sir Wilfred Stokes for trench warfare). He was appointed production engineer in 1929 and consultant in 1953. Since then he has been chiefly concerned with the manufacture of very large excavators.

Mr. H. M. WOODHAMS, managing director of Sir W. G. Armstrong Whitworth Aircraft, Limited, of Coventry, was on October 27, the recipient of a portrait of himself. The work of Mr. Robert Swan, it was the gift of the firm's senior staff to mark Mr. Woodhams' 65th birthday last August. The gift was presented to him at a dinner party in Coventry, and handed over by Mr. F. MARTIN, commercial manager and chairman of the firm's social club. Mr. Woodhams has been with the company for 23 years and played a major part in its development. He is at present engaged in directing the company's research activities.

Mr. WALTER LATTMAN and Mr. CHARLES F. HERRMEYER, both senior executives of Massey-Harris-Ferguson (Manufacturing) Limited, have been appointed directors of the company. Mr. Lattman, group vice-president responsible at head office for Eastern Hemisphere operations, joined the company 28 years ago. From 1950-54 he was vice-president, general manager of the Massey-Harris European division. Mr. Herrmeyer, vice-president finance, joined the Ferguson company in 1934, and prior to the merge of Massey-Harris and Ferguson interests, he was vice-president and treasurer of Harry Ferguson Inc., Detroit.

Obituary

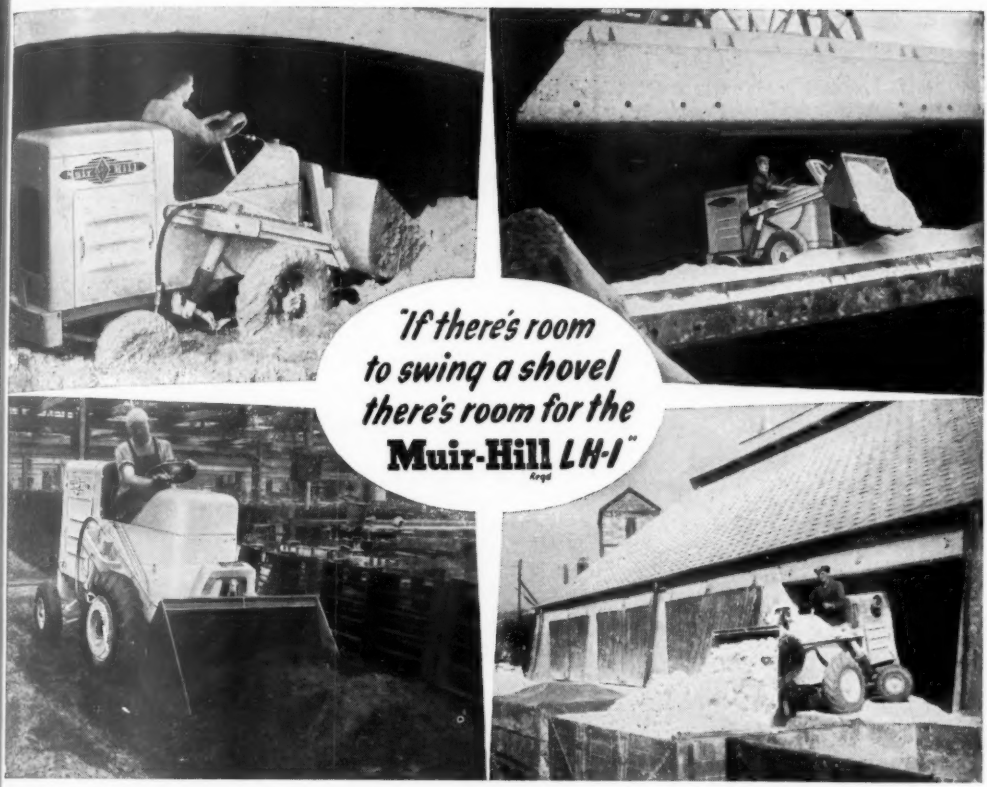
The death took place recently of Mr. CHARLES E. KERRIDGE, of Charles E. Kerridge, Limited, metal merchants, of Rainham (Essex).

Mr. GEORGE WORTHINGTON, former general manager of Richard Berry & Son, manufacturers of springs for motor-cars, of Aston, Birmingham, has died at the age of 72. He retired at the end of March after 55 years with the company, but continued in an advisory capacity.

Mr. DAVID M. FINDLAY, whose death is reported, was managing director of Wm. Findlay & Sons, Limited, engineers and tool specialists, of Newcastle-upon-Tyne. He was a holder of the M.C., the Croix de Guerre, and for his work at the War Office during the last war received the O.B.E. and the American Legion of Honour.

Mr. HARRY PETERS, works director of the Birmingham Aluminium Casting Company, Limited, one of the Birmid Industries group, died on October 23 in Michigan, USA, while on a visit to America. Mr. Peters had been with the firm for many years, and had been in turn manager of the gravity-die department, works superintendent and works director.

Mr. EDWARD HOUGHTON, who joined the Sheepbridge Coal and Iron Company, Limited, over 50 years ago, died recently at the age of 76. He held the position of blast-furnace manager when he retired in 1941, and since that time he had acted as consultant for blast-furnace work at Sheepbridge and at Clay Cross Company. He was also consultant to the Renishaw Iron Company, Limited.



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It does not matter what material you are handling, the LH-1 has the right bucket for the job, with a range of 14.5, 10.5 and 6.5 cu. ft. capacities, a special ore bucket and a fork lift attachment of 1,000 lbs. rated capacity with evenly distributed loads.

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News in Brief

H. J. MAYBREY AND COMPANY, LIMITED, metal founders, are having an extension erected to their premises in Worsley Bridge Road, London, S.E.26, at a cost of £35,000.

AS ALREADY ANNOUNCED, the Census of Production to be taken in 1957 for the year 1956 will be a simplified census on a sample basis, similar to last year's census, firms affected have already been notified.

THE NATIONAL AND MIDLAND IRONFOUNDERS' Association (previously known as the Midlands Ironfounders' Association) has been accepted as a member of the Council of Ironfoundry Associations.

TWO FLOORS at Earls Court, comprising some 330,000 sq. ft., will be used to accommodate the exhibitors at the sixth Electrical Engineers (ASEE) Exhibition to be held at Earls Court, London, from April 9 to 13, 1957.

TEN JUNIOR EXECUTIVES of Hadfields, Limited, steelmakers, Sheffield, have attended a week's residential course designed to provide an insight into the overall working of a large firm, such as Hadfields, in all its departments.

SAMUEL OSBORN & COMPANY, LIMITED, are to erect a shell-moulding foundry, and an administration building, in Station Road, Halfway, near Chesterfield; the plans for these have been approved by Chesterfield Rural District Council.

AGREEMENT TO CO-OPERATE in planning and constructing steel and steel-processing plants in underdeveloped areas has been reached between the German steel firm, Krupps, and the Blaw-Knox Company, of Pittsburgh, Pennsylvania, US.

CONTRACTS for eight mobile cranes have been placed by the British Transport Waterways as follows:— Two 5-ton cranes from Thos. Smith & Sons, Limited, Rodley, Leeds; one 5-ton and three 3-ton cranes from Ransomes & Rapier, Limited, Ipswich, and two 4-ton cranes from Steels Engineering Products, Limited, Sunderland.

A SCHEME, financed from Scottish sources, to provide factories to rent is to be launched immediately by the Scottish Council (Development & Industry). At the first stage they will be content to be intermediaries in one or two cases, but if the experiment succeeds they will go on to consider the setting up of a formal organization to take charge of the project.

THE METALLURGICAL ENGINEERING COMMITTEE of the Institute of Metals is holding an all-day informal discussion on "Degreasing" in the University, Edgbaston, Birmingham, on February 27, 1957. Members and non-members who would like to be present should notify the secretary of the Institute of Metals, 17 Belgrave Square, London, S.W.1., as early as possible.

To overcome the shipping shortage the Rootes group have despatched a shipload of cars for Canada on a specially chartered ship—Cape Sable. Transport for the cars from Coventry to Birkenhead formed one of the biggest convoys which the group has undertaken since the end of the war. Mr. Brian Rootes, managing director said that the ship had been chartered to keep faith with customers in North America.

A 70-TON MACHINE to be used for crushing rock at the Koyna dam in India was despatched from Pegson's engineering works at Coalville, Leicestershire, on November 1. It travelled by a special route to London where it will be shown in the Public Works Exhibition at Olympia, London. The machine can be taken down in sections not weighing more than 15 tons each to aid transportation to the mountain site where it will operate.

TWO HALIFAX FIRMS are to supply plant for atomic power-stations; P. M. Walker & Company (Halifax), Limited, ventilating engineers, Halifax, will furnish dust-extractor equipment of the high-efficiency centrifugal type. The other firm, William Asquith, Limited, machine-tool makers, are to supply two automatic transfer lines for machining the graphite block and tiles which comprise the reactor core of the atomic plant. It is the first order of its type to be placed in this country.

ALLIED IRONFOUNDERS, LIMITED, have entered the "oil-fired" appliance field with a domestic oil-fired boiler for small or medium-size houses. This "Rayburn" model, 32 in. high, 18½ in. wide and 20 in. deep, will, it is claimed, supply a 30-gall. cylinder and up to 100 sq. ft. of radiator surface for a maximum consumption of 30 gall. of oil per week. The boiler is thermostatically controlled, relies on natural draught and is said to be clean, almost silent and dust and fume free.

AN APPLICATION by the British Electro Metallurgical Company, Rotherham, for a site at Meadow Bank, Rotherham, for works expansion has been rejected by Rotherham Corporation because the area is reserved for playing fields. New buildings are required for the production of ferro-alloy briquettes and submerged welding powders. Other sites are being investigated but there is little land available, and the expansion plans are being held up. The firm produces a large amount of the requirements of the country for high-carbon ferro-chrome.

UNITED STEEL COMPANIES, LIMITED, have agreed to assist the University of Sheffield to create an independent department of statistics. Dr. G. H. Jowett, formerly lecturer in statistics at the University, has been appointed head of the new department and took up his new duties at the beginning of the current academic session. The post carries the rank of senior lecturer and will be known as "The United Steel Lectureship." Prior to joining the University, Dr. Jowett was a member of the staff of United Steel's research and development department.

THE NATIONAL COUNCIL FOR TECHNOLOGICAL AWARDS now has its own premises at 9, Cavendish Square, London, W.1. (Telephone: MUSEUM 1978.) The Rt. Hon. Lord Hives, C.H., M.B.E., D.S.C., LL.D., is the first chairman of the recently created National Council, an independent self-governing body whose function is to create and administer awards in technology for students in technical colleges who successfully complete higher technological courses approved by the Council. Their first award, the diploma in technology, was announced in May. The courses recognized for this diploma will be equivalent to honours degree courses at universities. The secretary to the Council is Mr. F. R. Hornby, M.B.E., M.A.

A SMALL EXHIBITION will be held in the University of Cambridge Engineering Department from November 5 to 17, to commemorate the publication of Sir Henry Bessemer's paper to the British Association entitled "On the Manufacture of Malleable Iron and Steel without Fuel." Exhibits will include a showcase of original Bessemer steel specimens made between 1856 and 1859, lent by courtesy of the Iron and Steel Institute; modern examples of steel made by the Bessemer acid process given by the Workington Iron and Steel Company, Limited, a model of a Bessemer plant lent by courtesy of the director of the Science Museum; a film-strip projector, automatically showing diagrams of a Bessemer converter in action; photographs, notes and diagrams.

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Raw Material Markets

Iron and Steel

Apart from the blast furnaces supplying basic pig-iron to the steelworks, from which an ever-increasing demand for supplies is forthcoming, makers of pig-iron find little difficulty in meeting present calls. This is the result of reduced requirements in all sections of the foundry trade. The furnaces engaged in making pig-iron for steelworks are distributing their outputs readily and there is no early prospect of any easing in the pressure for supplies. About 63 of the 100 furnaces now in blast are producing basic pig-iron for the steelworks, and the expansion in outputs from new furnaces to be brought in later is concentrated on the supply of this grade of pig-iron.

Some of the engineering and speciality foundries are favourably employed supplying castings for heavy electrical power plant, steelworks, collieries, etc. In addition to the falling-off in business in the motor-vehicle trade, there is also some decline (but not to the same extent) in business for agricultural implements and machine tools. The motor-car industry prospects, however, appear to be much brighter than for some months past, the Motor Show having resulted in substantial bookings in a number of cases. Substantial business is on hand in the machine-tool trade, and the foundries supplying castings to this trade are well employed. Recent orders show a slight decline, and deliveries have exceeded the rate of fresh bookings, which also applies to agricultural implements. The light-castings industry is quiet and there is little sign of general improvement. Textile foundries are not busy, while many of the jobbing foundries need more work.

Outputs of the foundry grades of pig-iron are maintained at recent levels and there is sufficient to satisfy current demands. In both the low- and high-phosphorus grades outputs exceed home demands. Consignments continue to be sent overseas, together with shipments of refined irons.

The re-rollers maintain good outputs and orders should ensure a continuity of production. Although there continues to be a slight falling-off in business for small bars, home consumers are specifying good tonnages, with the result that the mills cannot undertake all the business which is on offer from customers overseas. Some of the re-rollers are much better off for supplies of steel semis and also for manpower than others. Deliveries of steel semis from home steelworks are on a good scale, but imports have declined appreciably. Most mills appear to have fairly good stocks, and there is increasing pressure on home steelworks for certain sizes and qualities, chiefly the small-sized billets and carbon qualities.

Non-ferrous Metals

The dramatic intervention of Anglo-French forces in the Israel-Egyptian fracas stirred the London Metal Exchange in no uncertain terms. At one time last week copper was over £300 a ton, tin rocketed by some £80 to around £885 a ton, with a backwardation of about £50, and lead and zinc both gained a few points. Towards the end of the week, with the belief gaining ground that either the Anglo-French action would result in a cease fire or that UNO would settle the trouble, caused copper and tin to turn down sharply, but lead and zinc held on to most of their gains.

The Middle East situation still dominates the markets. As it has been reported that several ships have been sunk in the Canal, the availability of cargo space and dislocation of supplies are bound to be important factors affecting prices in the immediate future. This applies particularly to tin, the bulk of which from the East, normally comes through the Canal, so that it would not be surprising to see its price advancing towards the £900 mark. Although the demand position alone would not support such a level, it must be said that the demand for tin on both sides of the Atlantic is good and is expected to remain so, that spot metal is scarce, stocks are exceedingly low, and there is no surplus of production over consumption. Indeed, not until the Texas smelter closes down in about three months' time will there be any prospect of the supply position easing. Meanwhile, the squeeze on tin may well go on.

No special feature has marked the lead and zinc markets. Both metals are quietly steady in London and continue active in New York. Demand for "Prime Western" zinc at 13½ cents per pound East St. Louis is good, but the offtake of special high-grade metal still disappoints. The GSA is expected to be offered substantial tonnages again this month. Lead sales have been consistently good, with trading on the basis of 16 cents a pound.

Copper, after a short flurry which saw the price rise to over £300 a ton in London and to 36½ cents a pound in America, has now dropped back to a more realistic level. In the US demand is only fair, although supplies are moving well in the export market at 35½ cents a pound. The feature of the American market is the cut back in production of both Anacaonda and Phelps Dodge by eliminating weekend working, which will mean a combined total reduction in output of about 4,000 tons a month. The president of Kennecott stated last week that the company's future output will be geared to demand, which presently is showing some improvement. This clearly indicates that Kennecott will also produce below its capacity if demand remains poor. However, what price the Chilean Government will regard as being the "floor" below which it will refuse to export the red metal is the critical point to ponder.

Contracts Open

The dates given are the latest on which tenders will be accepted. The addresses are those from which forms of tender may be obtained. Details of tenders with the reference ESB can be obtained from the Board of Trade Export Services Branch, Lacon House, Theobalds Road, London, W.C.1 (telephone: CHAncery 4411, ext. 738 or 771), unless otherwise stated.

BELGIAN CONGO, November 29—Machine tools, for the Ministry of Colonies. (ESB/26844/56.)

FORMOSA, November 13—Seamless pipe, for the Central Trust of China, Purchasing Department. (ESB/27173/56/ICA.)

INDIA, November 27—Cast-iron pipes, for the Director-General of Supplies and Disposals. (ESB/27260/56.)

INDIA, November 27—Furnaces, for the Director General of Supplies and Disposals. (ESB/26575/56.)

LIVERPOOL, November 10—Two 750-kVa sub-station type transformers and two air circuit breakers and one distribution switchboard, for the Corporation. The City Engineer and Surveyor, Municipal Buildings, Liverpool, 2.

PORTUGUESE EAST AFRICA, December 3—Railway track equipment, for the Ports, Railways, and Transport Department. (ESB/27315/56.)

SOUTH AFRICA, November 21—Shot blast cleaning plant, for the Stores Department, South African Railways. (ESB/26785/56.)

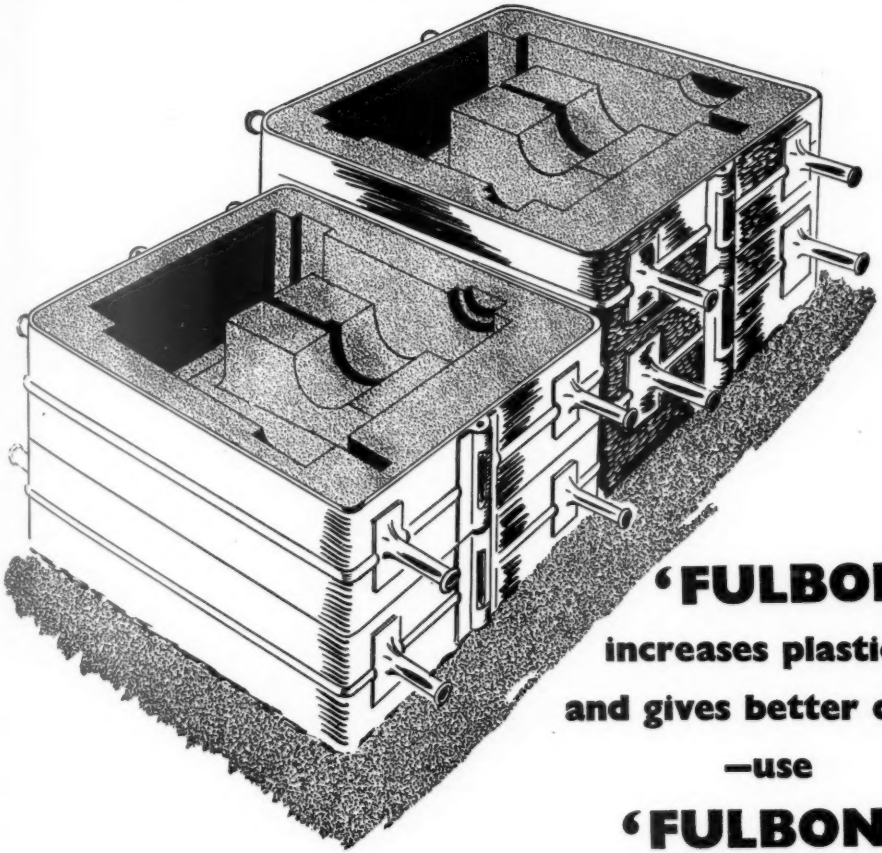
SOUTH AFRICA, December 5—40,500 aluminium silicon casting alloy ingot "AS" lb., for the Stores Department, South African Railways. (ESB/27329/56.)

SYRIA, November 18—Mobile electric crane, for the President of the Municipality, Latakia. (ESB/27339/56.)

URUGUAY, November 30—Boiler tubes and bushes and superheater elements for locomotives, for the Administracion de Ferrocarriles del Estado. (ESB/26840/56.)

URUGUAY, December 26—Machinery tools and measuring equipment, for the Administracion de la Obras Sanitarias del Estado. (ESB/26245/56.)

DEEP DRAWS...



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Current Prices of Iron, Steel, and Non-ferrous Metals

(Delivered unless otherwise stated)

November 7, 1956

PIG-IRON

Foundry Iron.—No. 3 IRON, CLASS 2:—Middlesbrough, £17 11s. 0d.; Birmingham, £17 3s. 3d.

Low-phosphorus Iron.—Over 0.10 to 0.75 per cent. P, £20 8s. 0d., delivered Birmingham. Staffordshire blast-furnace low-phosphorus foundry iron (0.10 to 0.50 per cent. P, up to 3 per cent. Si), d/d within 60 miles of Stafford, £20 12s. 3d.

Scotch Iron.—No. 3 foundry, £21 14s. 6d., d/d Grangemouth.

Cylinder and Refined Irons.—North Zone, £23 16s. 6d.; South Zone, £23 19s. 0d.

Refined Malleable.—P, 0.10 per cent. max.—North Zone, £25 4s. 0d.; South Zone, £25 6s. 6d.

Hematite.—Si up to 2 per cent., S. & P. over 0.03 to 0.05 per cent. :—N.-E. of England (local iron), £21 7s. 6d.; Scotland (Scotch iron), Zone S. 1, £21 14s. 0d.; Sheffield, £22 14s. 6d.; Birmingham, £23 2s. 0d.; Wales (Welsh iron), £21 7s. 6d.

Basic Pig-iron.—£18 3s. 0d. all districts.

FERRO-ALLOYS

(Per ton unless otherwise stated, delivered)

Ferro-silicon (6-ton lots and over).—45 per cent. Si, £48 0s. 0d. to £50 5s. 0d., scale 16s. 0d. to 17s. 6d. per unit; 75 per cent. Si, £70 0s. 0d. to £73 2s. 6d., scale 16s. 0d. to 17s. 6d. per unit.

Ferro-vanadium.—50/60 per cent., 27s. 6d. per lb. of V.

Ferro-molybdenum.—65/75 per cent., carbon-free, 12s. 3d. per lb. of Mo.

Ferro-titanium.—20/25 per cent., carbon-free, £250 0s. 0d.; 38/40 per cent., £299 0s. 0d.

Ferro-tungsten.—80/85 per cent., 15s. 8d. per lb. of W.

Tungsten Metal Powder.—98/99 per cent., 18s. 8d. per lb. of W.

Ferro-chrome (6-10 ton lots).—4/6 per cent. C, £93 10s. 0d. to £95 0s. 0d., basis 60 per cent. Cr, scale 29s. 9d. to 32s. 0d. per unit; over 6 per cent. C, £92 10s. 0d. to £93 0s. 0d., basis 60 per cent. Cr, scale 29s. 9d. to 32s. 0d. per unit; 2 per cent. C,* 2s. 1d. per lb. Cr; 1 per cent. C,* 2s. 1½d. per lb. Cr; 0.15 per cent. C,* 2s. 2½d. per lb. Cr; 0.10 per cent. C,* 2s. 2¾d. per lb. Cr; 0.06 per cent. C,* 2s. 3d. per lb. Cr.

Metallic Chromium.—98/99 per cent., 7s. 0d. to 7s. 6d. per lb.

Metallic Manganese.—93/95 per cent., carbon-free, £249 0s. 0d.; 96/98 per cent., £259 0s. 0d. to £265 0s. 0d.

Ferro-columbium.—65/75 per cent., Nb + Ta, 22s. 6d. to 23s. 6d. per lb., Nb + Ta.

Ferro-manganese (home).—78 per cent., £68 0s. 0d.

SEMI-FINISHED STEEL

Re-rolling Billets, Blooms, and Slabs.—BASIC: Soft, u.t., £28 19s. 0d.; tested, 0.08 to 0.25 per cent. C, £29 19s. 0d.; hard (0.41 to 0.60 per cent. C), £31 0s. 6d.; silico-manganese, £39 10s. 0d.; free-cutting, £33 3s. 0d. SIEMENS MARTIN ACID: Up to 0.25 per cent. C, £36 14s. 6d., silico-manganese, £39 17s. 6d.

Billets, Blooms, and Slabs for Forging and Stamping.—Basic, soft, up to 0.25 per cent. C, £34 13s. 6d.; basic, hard, over 0.41 up to 0.60 per cent., C, £35 16s. 0d.; acid, up to 0.25 per cent. C, £38 17s. 6d.

FINISHED STEEL

Heavy Plates and Sections.—Ship plates (N.-E. Coast), £35 7s. 0d.; boiler plates (N.-E. Coast), £37 17s. 0d.; floor plates (N.-E. Coast), £36 16s. 0d.; sectional material, N.-E. Coast, £33 16s. 6d.

Small Bars, Sheets, etc.—Rounds and squares, under 3 in., untested (4-ton lots), £36 3s. 0d.; flats, 5 in. wide and under (4-ton lots), £36 3s. 0d.; hoop and strip, £36 12s. 6d.; uncoated strip mill coils, not rolled, under 3mm. to 12g., £38 16s. 0d.; black sheets (hand mill), 17/20 g., £50 4s. 6d.; galvanized corrugated sheets, 24 g., £62 2s. 0d.

Alloy Steel Bars.—1 in. dia. and up: Nickel, £61 13s. 9d.; nickel-chrome, £85 10s. 6d.; nickel-chrome-molybdenum, £96 16s. 6d.

NON-FERROUS METALS

Copper.—Cash, £281 0s. 0d. to £282 0s. 0d.; three months, £282 10s. 0d. to £283 0s. 0d.; settlement, £282 0s. 0d.

Copper Tubes, etc.—Solid-drawn tubes, 2s. 9½d. per lb.; rods, 320s. 0d. per cwt. basis; 20 s.w.g., 355s. 3d. per cwt;

Tin.—Cash, £855 0s. 0d. to £860 0s. 0d.; three months, £807 10s. 0d. to £810 0s. 0d.; settlement, £860 0s. 0d.

Lead (Refined Pig).—First half November, £117 15s. 0d. to £118 5s. 0d.; first half February, £116 10s. 0d. to £116 15s. 0d.

Zinc.—First half November, £99 10s 0d. to £100 0s. 0d.; first half February, £96 5s. 0d. to £96 0s. 0d.

Zinc Sheets, etc.—Sheets, 15 g. and thicker, all English destinations, £131 10s. 0d.; rolled zinc (boiler plates), all English destinations, £129 5s. 0d.; zinc oxide (Red Seal), d/d buyers' premises, £110.

Brass Tubes, etc.—Solid-drawn tubes 2s. 3⅝ d. per lb.; rods, drawn, 3s. 1⅜d.; sheets to 10 w.g., 238s. 0d. per cwt.; wire, 2s. 11¼d.; rolled metal, 238s. 0d. per cwt.

Brass (Brazing).—BS1400, B3 (65/35), £204; B6 (85/15), —; BS249, —.

Brass (High Tensile).—BS1400, HTB1 (30 tons), £258 HTB2 (38 tons), — HTB3 (48 tons). —

Gunmetal.—BS1400, LG2 (85/5/5/5), £284; LG3 (86/7/5/2), £292; G1 (88/10/2/½), £348; (88/10/2/1), £338;

Phosphor Bronze.—BS1400, PB1 (AID released), £365 per ton.

Phosphor Bronze Strip, etc.—Strip, 341s. 3d. per cwt.; sheets to 10 w.g., 341s. 3d. per cwt.; wire, 4s. 5½d. per lb.; rods, 3s. 9½d.; tubes, 3s. 7½d.; chill cast bars: solids 3s. 9½d., cored 3s. 10¼d. (CHARLES CLIFFORD, LIMITED).

Nickel Silver, etc.—Rolled metal, 3 in. to 9 in. wide × 0.056, 4s. 0½d. per lb.; round wire, 10g. in coils (10 per cent.), 4s. 5¼d.; special quality turning rod, 10 per cent., ½ in. dia., in straight lengths, 4s. 4¼d. All prices are net.

Other Metals.—Magnesium, ingots, 2s. 4d. per lb. Antimony, English, 99 per cent., £210 0s. 0d. Quicksilver, ex-warehouse, £83 10s. 0d. Nickel, £519 0s. 0d. Aluminium ingots, £198 10s. 0d.; aluminium bronze (BS1400), AB1, £305; AB2, £314. Solder, brazing, BS1945, type 8 50/50), 3s. 1d. per lb., type 9 (54/46), 3s. 4½d. per lb.

* Average 68–70 per cent.

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Imports and Exports of Iron and Steel in September

The following tables, based on Board of Trade returns, gives figures of imports and exports of iron and steel in September. Totals for the first nine months of this year and last are also included.

Total Exports of Iron and Steel

Destination.	Month ended Sept. 30.	Nine months ended September 30.	
	1956.	1955.	1956.
	Tons.	Tons.	Tons.
Channel Islands	252	4,567	3,551
Cyprus	236	3,355	4,639
Sierra Leone	602	5,970	6,106
Gold Coast	1,362	17,589	17,955
Nigeria	2,636	35,811	41,524
Union of South Africa	2,603	50,708	50,403
Rhodesia and Nyasaland	6,387	49,135	64,233
Tanganyika	1,793	12,735	17,982
Kenya	2,312	34,853	34,651
Uganda	541	3,293	3,868
Anglo-Egyptian Sudan	1,723	12,279	10,923
Mauritius	194	1,870	2,612
Aden	44	5,972	4,308
Bahrain, Qatar, and Trucial States	1,150	7,926	8,503
Kuwait	578	1,939	5,453
India	19,946	95,945	223,164
Pakistan	5,230	31,043	40,271
Singapore	2,739	26,607	23,123
Malaya	1,751	17,883	26,525
Ceylon	1,257	12,341	23,105
British North Borneo	319	3,608	4,558
Hongkong	7,325	33,915	47,279
Australia	11,584	291,940	154,379
New Zealand	11,329	193,349	135,694
Canada	18,315	84,503	217,912
Jamaica	1,257	11,539	17,206
Trinidad	5,111	33,392	30,435
British Guiana	486	5,357	3,901
Other Commonwealth countries	1,968	15,912	20,657
Eire	4,435	44,355	50,287
Finland	5,331	55,897	41,550
Sweden	5,708	99,905	83,376
Norway	6,912	82,484	63,630
Denmark	5,437	57,787	56,745
Western Germany	466	7,939	7,257
Netherlands	7,368	72,766	65,232
Belgium	1,832	15,769	24,816
France	1,522	4,426	6,794
Switzerland	1,308	10,662	10,376
Portugal	724	10,250	7,558
Spain	2,314	53,413	22,475
Italy	601	19,069	12,911
Austria	431	2,160	3,411
Yugoslavia	874	11,054	6,142
Greece	394	6,849	4,172
Turkey	36	6,785	2,962
Netherlands Antilles	95	9,024	6,478
Portuguese East Africa	208	1,432	2,304
Lebanon	21	13,074	4,874
Egypt	924	16,286	34,788
Israel	450	7,856	6,425
Saudi Arabia	2,372	5,049	10,783
Iraq	563	32,423	22,971
Iran	1,179	44,373	46,581
Burma	230	8,392	5,810
Thailand	1,162	4,058	5,798
Indonesia	392	3,048	7,965
Philippine Republic	957	5,427	5,583
USA	6,351	37,128	41,923
Cuba	1,045	3,743	6,763
Colombia	465	4,563	3,170
Venezuela	3,345	42,621	50,682
Ecuador	322	2,317	3,026
Peru	1,539	7,671	12,168
Chile	132	728	756
Uruguay	256	5,506	3,477
Argentina	2,548	40,807	39,187
Other foreign countries	7,870	25,964	43,791
TOTAL	189,149	1,988,396	2,079,917

Total Imports of Iron and Steel

From	Month ended Sept. 30.	Nine months ended September 30.	
	1956.	1955.	1956.
	Tons.	Tons.	Tons.
Rhodesia and Nyasaland	361	2,613	2,685
Australia	155	60	421
Canada	7,344	91,199	47,633
Other Commonwealth countries and Eire	315	21,682	5,211
Soviet Union	13,736	141,347	220,804
Sweden	7,247	23,614	38,268
Norway	12,113	57,705	79,476
Western Germany	14,658	43,076	164,446
Netherlands	7,777	122,726	78,478
Belgium	21,409	131,683	293,607
Luxembourg	2,993	28,079	48,553
France	7,066	182,695	187,114
Italy	1,302	1,293	9,914
Austria	9,007	90,305	120,890
Japan	865	21,039	12,809
USA	8,036	579,438	357,302
Other foreign countries	5,894	9,198	57,793
TOTAL	120,278	1,547,752	1,725,404
Iron and steel scrap and waste, fit only for the recovery of metal	75,624	939,027	806,875

Exports of Iron and Steel, by Products

Product.	Month ended Sept. 30.	Nine months ended September 30.	
	1956.	1955.	1956.
	Tons.	Tons.	Tons.
Pig-iron	12,660	37,797	90,764
Ferro-colombium (niobium)	—	49	122
Ferro-tungsten	56	402	813
Other ferro-alloys	285	2,518	3,104
Ingots, blooms, billets, slabs, sheets, and tinplate bars	38	3,917	1,282
Iron bars, rods, angles, shapes, and sections	148	2,559	1,552
Steel bars, rods, angles, sections, and shapes	28,304	319,398	337,363
Iron plates and sheets	22	117	164
Universal plates	116	6,588	3,079
Steel plates, ⅛ in. and under ¼ in.	806	14,580	7,184
Do., ¼ in. and over	18,261	194,142	171,084
Blacksheets and blackplate	16,279	163,226	165,653
Hoop and strip	4,863	79,119	63,816
Tinplate	20,031	237,400	218,592
Decorated tinplate	238	2,726	4,601
Galvanized sheets	12,063	122,178	115,142
Other (incl. tinned sheets, terneplate, and ternesheets)	995	10,694	11,107
Railway and tramway construction material	12,706	192,648	202,163
Wire rods	2,896	21,654	29,481
Wire	6,593	71,991	70,111
Tubes, pipes, and fittings	51,088	493,606	576,677
Iron castings	162	7,347	1,605
Steel castings	113	1,352	1,345
Forgings	420	2,388	3,113
TOTAL	189,149	1,988,396	2,079,917

IN ORDER TO FACILITATE the building of three 10,750-ton vessels—a recent contract worth several million pounds—the Atlantic Shipbuilding Company, Newport (Mon), is to extend its shipyard, which lies at the mouth of the River Usk.

WILLIAM JESSOP & SONS, LIMITED, Sheffield, and the BISRA laboratories, are both experimenting with a vacuum furnace to make vacuum-melted steels, and it is expected that they will be in commercial production within two or three years in Sheffield.